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EDITORIALS

A YOUNG INDUSTRY.

Fortunate indeed is the industry whose pioneers come into their own as have many of the leaders of electrical development in the past two score of years! The name of Alexander Graham Bell has been inseparably coupled with his great invention for more than a generation, and it was peculiarly fitting that Dr. Bell should have journeyed to Boston a few days ago to unveil in person two bronze tablets marking the birthplace and first complete application of the telephone. Provided by the Bostonian Society and the New England Telephone & Telegraph Company, these memorials add to the already rich historic interest of the Hub, and brief as the exercises were, they were profoundly satisfactory. From a total of two telephones in the world in 1876 to over 15 million today is indeed a development of immense scope, and in view of the achievements of radiotelephony lately accomplished and in prospect, it would be rash indeed to attempt to set a limit to the possibilities of electrical communication. That the electrical industry is still young is wonderfully evidenced by the continued active work of so many of its famous pioneers, sometimes, it is true, in scientific or other lines of their own choosing, but none the less valuable to the world at large.

LIGHTING AND ACCIDENTS.

It has come to be generally appreciated that accidents are more likely to occur in places which are not sufficiently illuminated, and that the cost of adequate illumination is justified upon this score alone. Actual demonstrations of this dependence of safety upon seeing usually result from improving inadequate artificial lighting, whereupon a decreased frequency of accidents is found to follow.

The ban upon generous artificial lighting in the streets of English cities, which has been brought about by the war and the fear of Zeppelin raids, has produced additional evidence upon this subject, but by a reversal of the usual sequence. The darkened condition of the streets at night and in the late afternoons has brought a large increase in the number of accidents in the populous districts, and especially in that class of accidents where automobiles are involved.

The question has been seriously raised as to whether this traffic danger is not more serious than the Zeppelin danger, the endeavor to avoid which has been the means of bringing it into being. This may well be a subject of dispute and differing opinion, but the relation of safety to adequate lighting has received another confirmation.

ARE POWER CONTRACTS PRIVATE?

The constitution of the United States bars out legislation impairing the obligation of contracts and the constitutions of many of the states contain similar provisions. The courts have not given these provisions literal and universal application, since under the common law certain contracts are not enforceable, such as contracts for immoral or illegal purposes, and such as are deemed contrary to public policy. The ordinary police powers of a state are not interpreted to be invalidated by such general provisions of the constitution and when legislation of this type comes in conflict with private contracts, the latter are no longer enforceable, and, moreover, the performance of their provisions may be enjoined, should they conflict with public interest.

The power of the state to regulate the rates and service of public service corporations has been firmly established, subject to the condition that private property shall not be taken for public use without just compensation. The establishment of rates by act of legislature or by a commission created by the legislature for the purpose frequently conflicts with contracts previously made between a company and a customer. Nearly every state commission and every electric power company has experienced instances of this kind. In most instances it is recognized by both parties to such a contract that the contract must thereupon terminate, and the legal rates thereafter be applied. Strength is given to this position by the provision usually found in utility laws which stipulates that there shall be no discrimination shown in the rates to different customers receiving similar service, and the special rates established by private contract would constitute discrimination if they were either higher or lower than those paid by others in the same class.

The courts have generally supported the impairment of contract obligations in cases of this kind, and the Supreme Court of the United States has affirmed this attitude in a number of cases, notably those involving railroad rebates. It is with surprise, therefore, that we note a recent decision of the Supreme Court of the State of Washington, where the right of the Public Service Commission of that state to interfere with a private contract for power between the Washington Water Power Company

and the Spokane and Inland Empire Railroad Company seems to be involved. This question did not directly come up, however, the ruling being upon the right of the Commission to have the terms of the contract disclosed. A mandamus for this purpose was denied by the court.

Obviously a commission is not in a very good position to determine whether rates are reasonable until it knows what the rates are, nor can it very well carry out the dicta of the Supreme Court in fixing rates without access to the records of the operating company.

ELECTRIC-UTILITY BONDS AS INVESTMENTS.

The financial writer of a daily newspaper is quoted in another column as stating that utility bonds have come into high favor as investments by banks and insurance companies, a great contrast as compared with their attitude some twenty years ago. The innate reliability of the securities of the electric utilities has long been known to the well-informed, but large financial institutions have been slow in coming to a realization of the fact and then in acting upon it. The securities of steam railroads still continue to be received with greater favor than those of electric companies. This is evidenced by market prices for bonds such that the net interest is lower on the average for the bonds of steam railroads than for those of electric utilities. This is contrary to what might be expected from the financial records of the two classes of securities.

About three years ago we published two articles giving specific information on this subject. Statistics compiled for a long term of years showed that the chances of receivership or insolvency proceedings for gas and electric utilities were far less than for steam railroads, which indeed were not much better than the average listed industrial corporation in this respect. The gas and electric average was close to that of the national banks. On the other hand, the net earnings of the electric and gas corporations have not only greatly exceeded those of the steam railroads, but have even exceeded the average of the prominent industrial corporations, in ratio to capitalization. Not only has the risk of receivership been only about one-fifth as great as for steam railroads, and net earnings nearly twice as great, but the earning power is much better sustained. This was beautifully demonstrated a year ago. When business generally was highly disorganized after the outbreak of the European war, the electric power companies not only maintained earnings, but generally took on new business, thus repeating the experience of the panic of 1907.

In spite of all this evidence of the intrinsic superiority of the securities of electric utility corporations, they must continue to pay higher rates for new capital than the steam railroads. This of course is determined by the attitude of the average investor. Why does he continue to give preference to the steam railroad over the electric utility? Ignorance, habit and prejudice are no doubt all involved in the answer to this question. It is often stated that man differs from the lower animals in being a reasoning being. True, he is reasoning, but not reasonable. Confronted with incontrovertible facts, he continues to act from habit and prejudice. He is essentially and inherently conservative. The statesman or politician who avoids subjecting issues to popular vote for fear of radical action displays his ignorance of human nature. You may convince the average man that things should be changed, but he continues to do them in the old way. The carrying out of a reform usually awaits the next generation.

So even the recognition by banks and other financial institutions of the value of electric securities has not sufficed to put them upon a level with railroad securities. Well secured first-mortgage bonds of electric power companies are today being marketed at prices which net the investor as high as 6.5 per cent. At the same time these very securities are acceptable collateral for bank loans at a rate of, say, 4.5 per cent, while money goes begging for loans on commercial paper at as low as 3 per cent, with call money at 2 per cent. These conditions are of course abnormal, and probably will not continue after the end of the war. With money more freely invested, the net rate on electric bonds is likely to come down, which means that market prices on old issues will advance. All of which goes to point out the desirability of present investments in such securities for those who prefer safety with good return to the uncertain allurements of the "war brides."

MAKING THE MOST OF APPLIANCE DELIVERIES.

A recent study of appliance deliveries by a large central-station sales organization disclosed the importance of utilizing every possible occasion to help the customer toward the most satisfactory use of his installation. It seems that in many cases where appliances were delivered by parcel post of by parcel express, the mere cost of placing them in the customer's house or store ran below the expense of distributing such equipment by a special wagon or truck owned by the central station itself. Thus, the average package cost for a year for both parcel post and parcel delivery service was about 13 cents, whereas in a previous year when the company endeavored mainly to handle the deliveries itself, this unit cost was from 75 to 100 per cent greater.

Offhand one might conclude that reliance upon outside organizations specializing in the delivery of apparatus and material of relatively small bulk would therefore be most advantageous; but a deeper study of the situation indicates the contrary. In the first place, the frequent appearance on the streets of a well appointed motor-vehicle bearing the company's name and such effective advertisng of central-station service as occasion requires, is a benefit to the business which cannot easily be overestimated. Here is an opportunity for the central station to secure some highly distinctive publicity, especially in the way of electric sign and flasher effects

for evening service; and the whole tendency of modern merchandising is toward the maintenance of evening delivery service in large cities and their suburbs. Dwellers in suburban streets are seldom overburdened with outside lighting displays, and a little peripatetic work of this kind will surely attract attention that very properly may be diverted into profitable channels. Why should not the central station's delivery vehicle come to be recognized as a genuine "Chariot of Light," with its appearance varied according to the season of the year and its passage through the regrettable Stygian darkness of many a suburban thoroughfare utilized for all it is worth as a moving example of what can be done with modern lamps?

Even more important is the value both to the central station and to the consumer of giving the latter skilled attention at the time when his appliance goes into service. Electrical conveniences are wonderfully simple, it is true; but a few words of counsel in placing them on the local circuits are very much appreciated. We have known of cases where the failure to replace six-ampere fuses by ten-ampere fuses when a substantial appliance was added to a house-wiring circuit left the family in darkness until the next morning—a not easily excused condition, of course, but one which should be avoided on all counts. If the fuse had been changed at the time of appliance delivery, the customer would have had no difficulty. Again, if the delivery man takes a moment to explain again to the purchaser just how the appliance is to be disconnected, troubles sometimes arising from improper handling of cords, buttons, etc., will be avoided. Many a customer listens to an explanation of the working of an appliance in the company's office downtown, and then forgets just how to secure the best results when he arrives at home, simple though the operation of most appliances is.

When a new appliance goes into use in a home or store, the immediate successful service of it cuts a large figure in the future attitude of the customer toward other electrical conveniences. One would not expect the delivery man to cook a meal for the benefit of the customer when a range is left at the house, of course, but as the customer is often in a very receptive mood at such a time, it seems a pity to let slip the opportunity then afforded to apply the electric service gospel in a practical way. Often the most trifling adjustment is all that is required to secure immediate satisfaction in the use of an appliance, and "every little helps" indeed in increasing the load on the commercial circuits. The advantages of such contact with the customer are too great to be thrown away, even at a moderate increase in the delivery expense of electrical conveniences. We can see no reason why in some cases it would not pay to equip the delivery wagon with a goodly number of light appliances for immediate delivery, supplementing the work of the driver with the services of one of the company's trained salesmen. Electrical development cannot be confined to banking hours if a company is going to fulfill its true mission in its territory and meet all the needs of its customers.

RESIDENCE HEATING.

The convenience and adequacy of the electric heating of residences is brought out in an article in this issue describing an installation in Ottawa, Canada. Uniformity in the supply of power results in uniformity of temperature, and the latter can be easily adjusted by means of the control provided. While the electric current may be used indirectly, hot water or hot air carrying the heat to the rooms where it is desired, it is simpler and probably more satisfactory in most cases to use direct radiation, or air heaters in each room.

The cost of any electric service is not the only criterion of whether it will be used in competition with other means of satisfying an existing need, and yet it is always a consideration. In most localities, with the prevailing prices for fuel and electric energy, this will be the determining factor, as the prices for electric energy can not usually be reduced to the point where it is financially possible to the average householder to utilize it exclusively for residence heating. For emergency use, however, either in mild or in extremely severe weather, the possibilities are large.

A commission which was appointed in Stockholm, Sweden, to investigate this question from the standpoint of its economic possibilities, made a report in 1914. Experiments were carried out with special reference to the heating of the City Hall, and a comparison made with hot-water heating, using coke for fuel. It was found that 198 kilowatt-hours were equivalent to one hectoliter of coke, provided current were used continuously. Since the conversion of electric energy into heat is complete, this indicates a utilization of 60 per cent of the total heat in the fuel. By intermittent use of electric energy, 120 kilowatt-hours answered as well as the above amount of coke. This is 40 per cent less than the above. For equal cost, with coke at 40 cents a hectoliter, it would be necessary to secure electric energy at one-quarter cent per kilowatt-hour, or if used intermittently at 0.4 cent. Even with hydroelectric plants, such a price can seldom be made to small consumers, if it is to supply the main revenue.

Where energy may be supplied during the winter season as a by-product the conditions are of course altered. The Washington Water Power Company has made experiments in electrically heating its office building in Spokane with surplus power, and finds it feasible both technically and financially. In this case the old steam radiators are retained, and the steam boilers are electrically heated. This equipment has been used for three years, and is soon to be duplicated in a large substation building.

Whether a rate can be made at Ottawa which will permit taking on a commercial load of this kind remains to be seen. The Ottawa Electric Company operates a hydroelectric plant supplying energy at low unit cost, but there have been periods in some winters when the water has failed and the steam reserve station has been called upon to carry the load. This considerably increases generating costs, and makes the problem much more difficult. Its solution will depend largely upon the data supplied by Mr. Ahearn's installation.

Happenings in the Industry

Securities as Safe Investments—Telegraphic Report of Minnesota Electrical Convention—Trade Press Association Reorganized—Indiana Commercial Men to Meet—Report of Wisconsin Electrical Association Meeting at Milwaukee—Gas-Filled Lamps Discussed at Chicago ---Ohio New-Business Convention Report—Annual Meeting of Electrical Manufacturers

Securities of Public Utilities Sought by Banks—Financial Authority Explains Change of Attitude Regarding Safety of Issues.

Had anyone predicted, say two decades ago, that old and first rank bond houses and the bond departments of banks would in time advise the purchase of public utilities securities, he had been put down as a dangerous dreamer; one who should be relegated to the position of messenger or doorman. This is the statement of Boersianer, financial editor of the Chicago *Examiner*, in a recent issue of that publication.

In those days there were only three classes of bonds, with a "safe" label—government, state, municipal and steam railways, particularly the last named.

It mattered not that several states had repudiated their obligations, that there had been hard luck municipalities innumerable, that the panic of 1893 had finally forced one-third of the total railway mileage into bankruptcy, and that rate-cutting and rebating threatened the solvency of the other two-thirds.

Europe could teach the American bond sellers nothing. For decades, the values of approved European industrial companies—specifically public utilities—had taken a place beside older—longer seasoned—issues; were bought liberally by all fiduciary institutions, including, note it well, insurance companies.

The American bond salesman was of the same timidity toward public utilities as had been a little while before the governors of the American stock exchanges who were reluctant to almost downright refusal to admit these securities to the "regular" trading list, though, again, the European bourses had admitted them long ago.

Today, the contrast is startling—save in one highly important quarter. Stock exchanges eagerly invite such listings. Financiers compete keenly for the underwriting of public utilities. Investment houses outbid each other for the bonds. The public—the average investor—buys them readily.

There are reasons. When banks take on increasingly for permanent investment a certain line of securities, such securities inevitably grow in general favor. The record shows that from December 31, 1914, to December 31, 1915, the banks bought $125,000,000 more public utilities bonds than in the previous twelve months.

The banks bought increasingly because the mortality among public utilities is decreasing year by year; for the further reason that net earnings are rising and from the best of all reasons, that the margin of safety is constantly widening.

It may sound like a paradox to say that the safer width comes from closer public supervision of these companies. Officials of public utilities companies have not always a high opinion of state or municipal officiality. There are constant covert charges of ignorance, incompetence, of venality. But after all, state and municipal surveillance—with the enlarged powers conferred on the commissions—has made the operations of these enterprises an open book more or less and has thereby the more guarded the investor.

ELECTRIC COOKING DISCUSSED AT MINNEAPOLIS.

Possibilities of Range Business Pointed Out at Convention of Minnesota Electrical Association.

The practicability of the electric range was the keynote of the discussion on the first day's session of the ninth annual convention of the Minnesota Electrical Association, which was held at Minneapolis, Minn., March 21 and 22. The central-station owner's and manufacturer's viewpoints, as well as customers, together with various problems for introduction of ranges in homes, initial installation costs and rates for energy formed the basis for lively and educational discussion, participated in by large number of members. The discussion resulted in a thorough review of conditions met with by central stations in seeking this business.

The convention began Tuesday morning with a registration of 125, the largest in the history of the Association.

At the opening session, President T. D. Crocker spoke of the prosperity of the section represented by Association members, saying it was unaffected by outside business depression, and that central-station owners in the Northwest can look forward to even greater prosperity with assurance. He stated central stations should fix rate schedules so that the load-factor can be increased, and best efforts should be made to secure large power consumers at high load-factors. He laid stress on need of an efficient legislation committee in the association.

The report of the secretary-treasurer, F. A. Otto, showed the finances of the association to be in a very creditable condition. The membership committee reported the addition of seven new members during the year.

The afternoon session began with a paper by J. D. A. Cross, of Chicago, on "Possibilities and Practicability of the Electric Range." The presentation of this paper was interrupted by the arrival of Mayor Nye, who expressed his cordial greetings to the association in his welcoming address. As a member of an electrical organization himself, he stated his appreciation of the progress of the industry. He cited it as typical of the trend of the world toward better service and conditions. Mr. Cross then continued with his paper. He outlined the distinctive advantages of electric ranges for cooking, such as convenience, cleanliness, uniformity of results obtained and ease of operation. He stated that the heating efficiency of electrical ranges is 75 per cent; that of gas ranges, 25 per cent. He then gave a table of comparative costs on that basis, gas at $1 being equal to energy at 1.75 cents per kilowatt-hour. He gave methods of demonstrating ranges in homes of prospective customers, and stated that the first ranges installed in a city should be closely watched to avoid unfair criticism. Mr. Cross pointed out the desirability of ranges as a central-station load, the average yearly income in a number of states being given at $66. He concluded by saying that electric cooking has too many advantages to be compared with gas or coal.

In the discussion following, R. F. Pack, of Minneapolis, stated that the electric range was too much a piece of electrical apparatus and too costly, but this would be over-

come in the same manner as with the gas ranges. He emphasized the high diversity-factor, and explained the rates recently put in effect in Minneapolis.

J. C. Bang, of Madison, brought up the question of rearrangement of lines and the problems of metering for range loads. He was answered by quotations from several members giving line changes necessary for about 25 per cent of new customers and averaging $30 per customer.

Ludwig Kemper, of Albert Lea, said the electric range movement was premature, but his remarks met with general opposition. All present favored the movement but seemed to wish better means of introduction of ranges.

George Fiske, of the General Electric Company, next gave a brief summary of progress in flood lighting. His talk was illustrated by a number of excellent slides.

The last paper of the session was that of W. C. Beckjord, of the St. Paul Gas Light Company, on "Rates for Electric Service," which took up the problems involved in a very comprehensive manner. The history of rate-making was reviewed. Data on a hypothetical case of a typical installation were given, showing methods of arriving at correct rate for different classes of consumers. Simplicity of rates for small users was advocated, a block rate being suggested as most satisfactory, with a minimum rate to cover fixed charges. Curves were shown of transformers on typical lighting loads.

The discussion was short, emphasizing in detail points brought out in the paper.

The Association was the guest of the Minneapolis Jovian League at luncheon on Tuesday noon. In the evening a rejuvenation was held at which 80 candidates were taken into the Order.

On Wednesday papers were presented on "Boiler Efficiency," "Rural Extensions" and "Attitude of the Central Station Towards the Consumer." A discussion on concentric wiring was also held. A more detailed report of Wednesday's sessions will be given in our next issue.

Federation of Trade Press Associations Reorganized.

The Federation of Trade Press Associations, composed of trade, technical and class papers representing every phase of industrial and professional occupation in the United States, held a constitutional convention at the Fort Pitt Hotel, Pittsburgh, Pa., on Saturday, March 18, at which resolutions were adopted making effective the immediate reorganization of the association. Heretofore the Federation has been made up of memberships of local associations representing territorial divisions of publishing, including trade press associations with headquarters in Chicago, New York, St. Louis, Philadelphia and Boston, with a number also of affiliated publications not resident in these centers.

Under the new plan of organization membership is by individual publications upon a democratic and national basis, the new organization to be called "The Associated Business Papers." William H. Ukers, publisher of *The Tea and Coffee Trade Journal*, chairman of the Committee on Reorganization, drafted the new constitution and by-laws, which were unanimously adopted.

Committees will be appointed to co-operate with the Federal Trade Commission to secure data relating to the industrial resources of the nation, and with the Bureau of Foreign and Domestic Commerce to carry forward plans for studying and making available to American manufacturers information regarding opportunities for both domestic and foreign trade.

Membership in "The Associated Business Papers" will be based upon rigid adherence to the "Standards of Practice for Business Papers" adopted by the Associated Advertising Clubs of the World, and embodying audited and verified proofs of circulation.

The president was authorized by the executive committee to proceed immediately to carry out the plans contemplated under the reorganization, including the engaging of a permanent secretary and business headquarters, participation in the convention of the Associated Advertising Clubs of the World and preparation of a directory listing the member publications, with stated circulation and proof of audit and information.

The officers were continued until the annual meeting, September 21, 1916, as follows:

President, A. A. Gray, ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, Chicago.

Vice-president, W. H. Ukers, *Tea and Coffee Trade Journal*, New York.

Secretary-treasurer, Charles-Allen Clark, *American Paint and Oil Dealer*, St. Louis.

Indiana New-Business Men to Hold Convention.

A convention of the New-Business Committee of the Indiana Electric Light Association will be held at the Elks Club, Kokomo, Ind., on Wedensday, April 19. O. M. Booher, of the Indiana Railways & Light Company, Kokomo, is chairman of the committee and has arranged for a very interesting program which includes a paper entitled "Electric Cooking" by Pierre L. Miles of the Globe Stove & Range Company, a paper by P. H. Palmer of the Indiana Railways & Light Company entitled, "Facts and Figures on Rural Extensions," and a paper entitled "Forecast and Co-operation" by R. A. McGregor and A. C. Riggs, both of the Merchants' Heat & Light Company, of Indianapolis.

These papers are being prepared in advance and submitted to prominent new-business managers of Indiana companies so that a comprehensive discussion of each subject is assured. There will be a luncheon at noon at the Cortland Hotel at which Elwood Haynes will deliver an address on "Tungsten and Its Application to the Electrical Industry."

Electrical contractors and others interested in the commercial development of the electrical industry are invited to attend the convention.

Vermont Hydroelectric Company Expands Activities.

Rapid developments are taking place in the hydroelectric industry in Vermont, where the Hortonia Power Company, of Rutland, is now engaged in tunneling a mountain near Lake Dunmore to tap Silver Lake, where a storage reservoir up in the hills will provide a reserve supply of about 400 million cubic feet of water. A generating plant to be built near the shore of Lake Dunmore will have an ultimate capacity of 7,000 horsepower.

At Hortonia will be a development of about 1,000 horsepower, at Bethel, 1,000 and at Gaysville, 500 horsepower. It is proposed to extend transmission lines south to Brandon, Proctor and Tinmouth, covering an area of rich marble and slate deposits; to Middlebury and Bristol on the north, and from Bethel northeast to the granite region of the central part of the state.

The company owns and operates the Lake Dunmore Power & Traction Company, Neshobe Electric Company, Gaysville Electric Light & Power Company, Bethel Electric Light & Power Company, and White River Electric Company. In addition to the five hydraulic and three steam stations, the company owns undeveloped water powers estimated at 11,750 horsepower.

IMPORTANT UTILITY PROBLEMS DISCUSSED IN MILWAUKEE.

Wisconsin Electrical Association Considers Regulation, Rates and Street Lighting at Annual Convention.

Regulation of utilities by public service commissions, discussed from both the utility and commission standpoint, was accorded considerable attention at the eighth annual convention of the Wisconsin Electrical Association at Milwaukee, Wis., March 16 and 17. President M. C. Ewing, in the presidential address at the opening session, which was held jointly with the Wisconsin Gas Association, stated that the problems of regulated monopoly are being decided on their merits, but few of the really important principles of regulated monopoly have yet been thoroughly tried out or determined. The continued acquisition of private plants through condemnation in Wisconsin by various municipalities is, he thought, one evidence that regulation is not in all cases proving satisfactory. One of the dangers of regulation is that a considerable percentage of the people have established regulation for the continual enforcements of greater service and the continual reduction in rates. Local politicians, Mr. Ewing said, who have instigated unfair demands, in their disappointment, immediately condemned the commission and direct their efforts to municipal ownership, and condemnation elections are being carried upon prejudice rather than upon sound business principles.

He said the smaller electric street railways have had anything but a bright history and are facing a still darker future.

In regard to legislation affecting public utility companies, Mr. Ewing thought that the only effective method of avoiding unjust legislation is to furnish at public hearings, reliable, truthful and conservative information, opposed to glittering generality, prejudice and misrepresentation. When a proposed measure is unjust, discriminatory and confiscatory, intelligent effort ought to demonstrate that fact and once demonstrated and properly presented to the legislature there is as a rule little danger of bad legislation. The danger lies when utility interests fail to properly present their cases and let them go by default.

"The Attitude of the Wisconsin Railroad Commission on Security Issues" was the subject of an address of Harold L. Giesse, secretary of the Railroad Commission of Wisconsin, in which the question of regulation was discussed from the Commission standpoint. Mr. Geisse referred to criticisms that are frequently made to the effect that commission regulation has curtailed the development of public utilities. He thought that with statistics showing continual development and with recognized improvement of service there is no proof that this criticism is justified. He explained that the Railroad Commission of Wisconsin, as in other states, has no right to refuse an authorization of securities that are within the law.

One of the advantages of requiring authorization from the Commission before issuance of securities is that the priority of liens is definitely ascertained by the Commission. Reference was made to several litigations in which this point was disputed with the result that much difficulty was encountered in effecting reorganization and in some cases investors suffered losses. Mr. Geisse thought that one advantage of regulation was that there is a tendency to stabilize the industry and discourage exploitation of unsuccessful ventures. He pointed out that a promoter must, in order to secure a certificate of convenience and necessity, show ability to raise funds.

F. W. Walker of the Milwaukee Northern Electric Railway, in discussing Mr. Geisse's address, thought the valuation of a utility as made by the Commission for the purpose of authorizing issuance of securities should be the same as a valuation for rate-making. He thought that stockholders are not being protected because the Commission reserves the right to discount the value on which stock is issued for rate-making. He thought further, that the public does not always suffer from unsuccessful ventures and believed that exploitations should be possible. In this connection, mention was made of several interurban railway projects which from a stockholders' standpoint were unsuccessful, but which he thought certainly benefited the communities in which the lines were built. In answer to Mr. Walker, Mr. Geisse called attention to the fact that the laws of the state clearly defined different values for different purposes and it would be unfair to both public and utility to use the same valuation for determining rates as for authorizing security issues.

Utility Legislation in Wisconsin.

An address by John B. Sanborn of Madison, Wis., dealing with a review of state legislation during the past year was presented at the morning session, following the reports of committees. Mr. Sanborn pointed out that although many bills relating to public service companies were introduced in the last legislature, few amendments were made with the exception of the act to regulate jitneys. None of the legislation was enacted in a spirit hostile to public service corporations. He said both the companies and the public have accepted the principle of commission regulation. Modern legislative tendencies in Wisconsin have been to leave to the commission the working out of the detailed utility problems.

In an address by T. E. Lyons of the Wisconsin Tax Commission on "Methods of Taxation of Public Service Companies in Wisconsin," mention was made of the continually increasing taxes. During the year 1915 the increase alone totaled approximately $1,000,000. He said, however, that the tax burden in Wisconsin is comparatively low per capita as compared with other middle western states. Mr. Lyons mentioned some of the difficulties in determining the taxing value of public utilities, the three important considerations being investment, replacement value and earnings.

Rates for Residence Service.

The question of rates for residence electric service was discussed in a paper by A. C. Babson, manager of the Wisconsin Gas & Electric Company, of Watertown, presented at the session on Friday morning. This paper pointed out that the fixed elements in the cost of residence service are the controlling factors in the cost of serving this class of customers. Proper development of the residence business requires the encouragement of the long-hour user which can be done only if the costs are properly divided so that the short-hour user pays the share of fixed expense which he occasions. Mr. Babson said that local conditions must in every case determine the schedule of rates to be employed.

The ordinary residential rate schedules in general use were discussed, particular emphasis being placed on the schedule based on active or counted rooms. The chief disadvantage of the latter is the somewhat complex nature of the rate, although there are many advantages to counteract this feature. Of particular importance is the fact that such a rate does not penalize the use of appliances, nor does it necessitate frequent inspections of the installation, as is true of the rate based on connected load. In advocating this rate Mr. Babson held that the maximum demand of a customer's installation is a function of active rooms rather than number of outlets. With an active room rate, the complete wiring of houses for the many electrical conveniences is encouraged and expensive meter-

ing devices are unnecessary. The primary rate remains constant and this encourages better illumination and higher intensities, as economy in the use of energy will not lower the high-rate portion of the bill. The experiences of Minneapolis and Milwaukee were cited as examples of successful operation under the active-room rate schedule. In Minneapolis the number of residence customers increased 116 per cent since 1912 when the new rate was inaugurated. During the same time the connected decreased 47 per cent, the annual consumption per customer decreased 9 per cent, the annual use of the connected load increased 71 per cent and the average consumption per kilowatt connected increased 39 per cent. Similar results were obtained in Milwaukee. The number of residential customers increased from 5,908 in 1910 to 22,132 in 1915.

The general effect of such a rate, Mr. Babson thought, was to increase the number of residence customers and at the same time decrease the number of complaints. In regard to this item it was shown that, in Milwaukee, with 11,403 customers in 1912 there were 4,245 complaints; in 1913 there were 14,322 customers and 3,764 complaints; in 1914 there were 17,603 customers and 3,411 complaints, while in 1915 there were 22,132 customers and the number of complaints had decreased to 3,021. Some mention was made of electric cooking and the desirability of offering a low rate for this class of business which, however, should be based on off-peak use.

S. B. Way, of Milwaukee, in discussing this paper referred to the experience of the Milwaukee Electric Railway & Light Company and called attention to the high diversity-factor in residence business. With electric cooking in the western states, the diversity is 6 to 1. A rate based on active rooms, he said, eliminates the need for separate meters for cooking, and also the expense of separate billing, collecting, etc. The rate in Milwaukee for cooking is approximately two cents per kilowatt-hour, which makes electricity competitive with gas, although it is not recommended for heating water. He further thought that with the active-room rate, customers' bills would become stabilized and complaints minimized, particularly in cases where hours of use are long. The 50-cent minimum in effect in Milwaukee has helped to stimulate residential business which has been found profitable by the Milwaukee company.

Mr. Douglas, of Milwaukee, believed that the psychological effect of reducing rates is of as much value in stimulating new business as the actual reduction. He thought it more desirable to reduce the maximum rate from time to time rather than give customers the benefit of the reduction in a schedule such as the active room. In regard to electric cooking, he thought that the peak would occur during the winter peak of the station and this fact must be considered in making rates.

C. H. Shaw, of Sheboygan, and F. A. Pamperin, of Oconto, also discussed the paper. Mr. Pamperin explained that with a two-cent rate no difficulty has been found in securing electric-cooking business and considerable progress has also been made in installing electric radiators and electric water heaters.

Street-Lighting Rates and Contracts.

At the afternoon session the paper entitled "Street Lighting Rates and Contracts" was presented by G. W. Van Derzee, of the Milwaukee Electric Railway & Light Company.

The paper deals quite fully with street-lighting costs considered on a cost of service basis, and the advantages of such form of contract to the municipality are discussed. The condition of termination where service is rendered on a cost basis must necessarily be that the municipality guarantee the integrity of the utility's investment in special street-lighting equipment devoted exclusively to street-lighting purposes.

This paper was discussed briefly by Louis Friedman, of Chicago, Ward Harrison, of Cleveland, and S. B. Way, of Milwaukee. Mr. Friedman thought that central-station companies are inclined to take what they can get for street lighting, rather than make a rate based on the cost of service. Mr. Harrison thought that a depreciation of five per cent on street-lighting equipment should be divided and a higher depreciation rate for lamps and other equipment that is liable to become obsolete in much shorter period, included. Mr. Way thought that because of the low cost of lamps in comparison with other equipment necessary for street lighting it hardly seems necessary to estimate the depreciation separately for lamps and other equipment.

The report of the Committee on Rural Service was presented by W. E. Haseltine, of the Ripon Light & Water Company. This report embodies statistics compiled from a canvass made among central stations of the state. A total of 16 companies replied to questions submitted by this committee. These companies supply a total of 323 customers, having an average connected load of 32.2 kilowatts. The conclusions drawn by the committee are that rural service has not yet reached a point where it can be considered profitable. It is, however, rapidly reaching this point, especially in the more closely settled communities. It was recommended that careful development along sane lines of finance and adequate minimum payments be made; that the farmer be educated in the diversified uses of energy; and that every effort be made to extend high-tension networks, bringing the source of supply closer to the rural communities.

Election of Officers.

At the morning session on Friday a paper by H. W. Young, president of the Delta-Star Electric Company, of Chicago, entitled, "Outdoor Substations," was presented. This was illustrated with stereopticon views showing latest practices in outdoor substation work. At the afternoon session papers were presented by R. M. Howard, of Winona, on "Two Years' Experience in One-Man Car Operation" and by H. O. Seymour, of Milwaukee, on "The Telephone and the Electric Utility." Following these papers there was an informal discussion of the National Electrical Safety Code by S. B. Way of Milwaukee and an informal question box discussion.

The election of officers resulted as follows:
President, W. E. Haseltine, Ripon.
First vice-president, B. F. Lyons, Beloit.
Second vice-president, A. E. Pierce, Eau Claire.
Third vice-president, John St. John, Madison.
Secretary-treasurer, George Allison, Milwaukee.

Proposed Lighting Code Discussed at Joint Meeting of New York Sections.

The proposed Lighting Code was brought forward again on the evening of March 14, at the Engineering Societies Building, New York, at a joint meeting of the Sections of the American Society of Mechanical Engineers and the Illuminating Engineering Society.

The subject was introduced by C. E. Clewell in the form of a paper entitled "Modern Aspects of Factory Lighting and the New Code."

A discussion rather than a criticism was the answer of L. P. Alford, editor of the *American Machinist*, which completed the formal program. A general discussion then followed which was entered into by Messrs. Stickney, Burroughs, Law, Newlin, Bond and Bullard. Written discussion was also read from H. S. Wynkoop.

Characteristics of Gas-Filled Tungsten Lamps.

A meeting was held in Chicago on the evening of March 16 by the Chicago Section of the Illuminating Engineering Society, at which G. S. Merrill, assistant chief engineer, National Lamp Works, Cleveland, O., presented a paper entitled "Latest Developments in Incandescent Lamps." This was devoted almost entirely to the gas-filled or type C tungsten lamp. Mr. Merrill stated that the manufacturers are continuing lamp research and development, aiming steadily to improve the lamps. He described the general method of manufacturing and the characteristics of gas-filled lamps and pointed out that the degree to which the efficiency can be carried depends on an adjustment between the cost of energy and the cost of lamp renewal. As a rule, the cost of energy supplied to a lamp throughout its life is from 5 to 10 times the cost of the lamp; therefore, even a slight improvement in efficiency is of great value. Mr. Merrill touched on the photometry of these lamps and on their rating.

Lamps for stereopticon use have intensely concentrated filaments and operate at a higher temperature, giving a life from 150 to 200 hours with all-around satisfaction. The quality of the light emitted by the type C lamps accounts largely for their extended use for some special purposes. A close approximation to daylight quality is obtained by operating at high temperatures and by use of a special bulb rich in blue. Mr. Merrill pointed out that the average performance of a lamp is of much greater value than its initial results. He also referred to the need for educating the public in order to get the best service out of these lamps.

The discussion was opened by Preston F. Millar, of the Electrical Testing Laboratories, New York City, who called attention to the fact that while the work on type C lamps has been attracting most attention, the manufacturers have also been improving the vacuum lamps. He also called attention to the inaccuracy resulting from the old horizontal candlepower rating of lamps and strongly advocated the lumen rating; the latter, however, can not be brought about except by a gradual process of education. In lamp tests it is very important to have a large number of samples in order to get truly representative results. An interesting feature developed on testing has been that the small lamps on direct-current circuit lasted longer than similar lamps on alternating-current circuits, although the lamps that were survivors had a higher average candlepower. In general, the average life performance of lamps is fairly good and quite close to the rating. Mr. Millar called attention to the danger resulting from indiscriminate and unscrupulous sale of incandescent lamps improperly labeled, chiefly in the cheaper department and 5 and 10-cent stores.

S. E. Doane, of Cleveland, O., said it was extremely difficult to get proper lamp knowledge to the public. The result is a truly deplorable situation. Much difficulty has been met in making the public understand the value of the lumen rating. It is not generally known that manufacturers have many troubles; for instance, that filaments of seemingly identical purity have strikingly different properties. Filaments are now made to an accuracy within a few hundred-thousandths of an inch. In some special cases the less efficient lamps are needed; for example the concentrated-filament vacuum lamp is particularly serviceable where greater downward illumination is required with certain reflector equipment. Mr. Doane also touched on the value of daylight lamps in stores and stated that lamp salesmen are now in position to sell almost any quality of light desired.

Among others who discussed the subject were Chairman E. W. Lloyd, Morgan Brooks, H. E. Clifford, P. Junkersfeld, G. H. Lukes, P. S. Millar, J. R. Cravath, S. E. Doane and G. S. Merrill. Among the points brought out in the discussion were that American manufacturers have consistently advocated more light for the same money rather than the same light for less money, that the inferior lamps on the market are chiefly the imported types, that the efficiency of the type C lamp is so good that effective screening thereof is not only practical, but highly desirable. Respecting the gas filling, it was shown that argon is particularly advantageous in the smaller lamps only and that the higher lamps employ nitrogen to better advantage.

Residential Service Questions Discussed by Ohio Commercial Men.

The fourth convention of the present New Business Co-operation Committee of the Ohio Electric Light Association was held at the Arcade Hotel, Springfield, O., on Wednesday, March 15, and was no doubt the most enthusiastic meeting that has been held this year.

There were approximately 60 central-station salesmen in attendance connected with the different electric light and power companies in Ohio.

The meeting opened with a few remarks by the energetic chairman of the Committee, J. E. North, the commercial manager of the Springfield Light, Heat & Power Company, of Springfield, O., who introduced Weare Parsons, general manager of the same company, to deliver the address of welcome. Mr. Parsons extended a very hearty welcome to the delegates and told them how thoroughly the Springfield people appreciated the meeting being held in that city and in closing Mr. Parsons outlined briefly something about Springfield's world-known industries.

The first paper on the regular program was presented by E. Burt Fenton, the publicity manager of W. S. Barstow & Company, New York City, entitled "The Golden Rule in the Utility Business." There was a very interesting discussion on this paper, which was entered into by Chairman North, J. C. Matthieu, of the Dayton Power & Light Company; E. A. Beckstein, of the Sandusky Gas & Electric Company, Sandusky; W. A. Wolls, of the Columbus Railway, Power & Light Company, Columbus; W. Parsons of the Springfield Light, Heat & Power Company, Springfield; C. E. Yacoll, of the Mahoning & Shenango Railway & Light Company, Youngstown; and L. C. Spake, of the *Electrical World*, Chicago. Mr. Matthieu stated that it was his idea that the claim, adjustment or complaint department of any electric light company should be under the head of the new-business department, and this idea seemed to meet the approval of the other gentlemen who discussed the proposition. As an outcome of this paper and the discussion thereon, Chairman North reported that the Committee would have someone present a paper on the subject of handling complaints at the next convention of this Committee, which will be held in Newark, O., on Friday, May 12.

The next paper presented was entitled "The Value of Residential Business to the Central-Station Company," by G. A. Lowther, of the Sandusky Gas & Electric Company.

H. S. Gilhams, Jr., of the Westinghouse Electric & Manufacturing Company, Cincinnati, led in this discussion and he was followed by Thomas F. Kelly, of the Dayton Power & Light Company, Chairman North, E. A. Beckstein, of the Sandusky Gas & Electric Company, G. Marmon, of the Columbus Railway, Power & Light Company, and K. Fitzpatrick, Jr., of the Dayton Power & Light Company.

Mr. Gilhams in his discussion of the paper explained the present activities of the Union Gas & Electric Company, of Cincinnati, and told what was being done in connection with the national house-wiring campaign, which is being conducted by the Society for Electrical Development. Mr. Lowther in the discussion stated that an electric iron was given free to the owner of every old house that is wired in Sandusky by the electrical contractor who secured the contract. Chairman North explained the house-wiring proposition that is being conducted at the present time in

Springfield. Mr. Beckstein explained the campaign that was being started in Sandusky with "Wire Your Home Month," and told that the company is offering to give $1.00 or a carton of Mazda lamps to any of its present customers who turn in the names of house-wiring prospects from whom contracts are secured. Mr. Beckstein advocates the "going after" business in outlying districts on the theory that the gas mains are not extended as far as electric service lines, and by extending into these districts without gas service, as a rule 100 per cent of the business can be secured.

Mr. Marmon stated it was his belief that possibly about 30 per cent of the electrical appliances that are sold in this country are not in actual use, explaining that a great number of them are given as wedding gifts, etc., and if the receivers of these gifts are not living in a wired house, naturally the appliance is nothing more than an ornament. He, therefore, explained how by having more of these unwired houses equipped for electric service, that this number of electrical appliances would be greatly decreased. Mr. Marmon explained the present house-wiring proposition of the Columbus Railway, Power & Light Company, and told of the special offer of wiring a five-room house complete with fixtures for $24.71, and allowing the customer to pay in 10 monthly installments. Mr. Fitzpatrick stated it was his belief that the revenue of the central station could be greatly increased by the education of the electrical contractor to install suitable electrical appliance outlets when wiring houses.

The next paper presented was by Thomas F. Kelly, commercial manager of The Dayton Power & Light Company, entitled "Results Obtained from Kitchen-Service Installations." This paper is abstracted quite fully elsewhere in this issue.

This paper was discussed by Chairman North, F. C. Morrison, of the Ohio Light & Power Company, Newark; W. A. Wolls, of the Columbus Railway, Power & Light Company; E. A. Beckstein, of the Sandusky Gas & Electric Company; and K. Fitzpatrick, Jr., of the Dayton Power & Light Company.

Mr. Morrison stated that his experience with this kitchen service proposition was very similar to that in Dayton and that the revenue being received from electric kitchen service customers was more than anticipated.

Following luncheon, C. E. Ogden, of the Walker Vehicle Company, Cincinnati, presented a paper entitled "Electric Industrial Trucks."

Following the discussion on this paper, A. C. Shepherd, of the Cleveland Electric Illuminating Company, presented a paper entitled "Solving the Heating Problem and Securing the Power Business." This paper was illustrated with many very interesting curves containing information of great value on this subject.

This paper was discussed by J. R. McCoy, of the Columbus Railway, Power & Light Company; B. G. Tarkington, of Hodenpyl-Hardy & Company, Jackson, Mich.; Roscoe Oltz, of the Springfield Gas & Electric Company, Springfield, Ill.; T. D. Buckwell, of the Central Illinois Light Company, of Peoria, Ill.; and F. B. Steele, of the Dayton Power & Light Company.

Messrs. Tarkington, Oltz and Buckwell were in Springfield for this meeting and also to attend a conference of a number of the commercial managers of the Hodenpyl-Hardy syndicate of Michigan, Illinois and Ohio, on March 16, 1916.

After the adjournment the delegates in a body went to the plant of the Robbins & Myers Company, in Springfield, where they were first addressed by Mr. McGilvray, president, and after being given souvenirs, were taken through the plant in small groups under the leadership of very excellent guides.

Annual Meeting of the Associated Manufacturers of Electrical Supplies.

The first annual meeting of the Associated Manufacturers of Electrical Supplies was held on Thursday afternoon, March 16, at the Hotel Biltmore, New York City, about 150 representative manufacturers of the United States being present.

President R. K. Sheppard called the meeting to order and after roll call delivered an interesting and comprehensive address covering the work of the first year of the association, highly complimenting his associates and the committees for the work that had been carried out so thoroughly and capably.

Abstract of Mr. Sheppard's Address.

Happily in the winter of 1914-1915 we American manufacturers of electrical supplies and materials entering into electrical construction found our need of one another. It was a discovery which marks the close of one epoch and the beginning of another in the history of our industry.

Suddenly we discovered that most of the modern world and certainly every other division of the electrical fraternity in this country had far outstripped us in that they had discerned and partially used the power of industrial solidarity. They too had prospered by individualism but in that prosperity had found their common needs and the wisdom and economy of unitedly analyzing their common problems for their common good. They had built powerful organizations which co-ordinated their activities and compelled respectful consideration of their standards by all who dealt with them.

This Association is the result of our awakening. Unique among such organizations it provides for every member one or more jobs in which he may coin his own abundant compensation for effort expended. With an unprecedented variety of detail interests represented by our members, every manufacturer of electrical supplies may fraternize here with his own particular group in an autonomous section.

This entire fabric of co-operation in standardization of products for the benefit of the art and in analagous activities is built to endure only so long as it renders beneficent service both to each member directly and to all collectively. Let none of us selfishly seek here for individual benefits that will not help also our comrades in this movement.

Vital to the life and welfare of this organization was the selection of a general secretary. He must be energetic, experienced in the electrical industry, he must be constructive with the ability to select fundamentals from the heterogeneous multitude of possible activities, he must have a capacity for great visions and the power to transmute those dreams into realities, he must be tactful, discreet, and cn confided themes he must be silent as the grave.

The search, begun in March, was ended successfully in June, when your Board of Governors persuaded Charles E. Dustin to throw in his lot with us. With him on duty as our general secretary we stand today on a pinnacle of hope. I now bear grateful testimony to his devotion and efficiency.

I point with unalloyed joy to the activities of ten important sections, with 40 or more division committees in which more than 200 executive and associate representatives of our member companies are genuinely busy solving very many common problems which they could not, would not, or certainly did not discuss together in past years.

Without distinction, without qualification, let me thank you one and all for the part each of you has played already in the rapid development of that comraderie which dominates our section meetings and our meetings of the Board

of Governors. I know that all of you will gladly endorse the thanks which I extend especially to our lovable and brilliant counsellor and legal adviser, Thomas M. Debevoise, who has given unstintedly his time and his strong intellect to the upbuilding of our organization.

At first your Board of Governors supposed that bimonthly meetings would suffice but after the Association got into full swing last fall the mass of work accumulated for them in two months proved that monthly meetings of the Board must occur regularly except during mid-summer. So fifteen of you, active responsible officers and owners of large business enterprises, are regularly setting aside other important duties to foster and strengthen this co-operative movement. As officers and chairmen of your ten sections and your forty odd committees others of you, men of big affairs, are devoting your time and strength to the specific problems of your divisions of the electrical industry. Are not those facts prima facie evidence of the serious purpose and the dignity of this Association?

Your organization committee tried to provide a plan, at trivial cost to each member company, which in emergencies would enable us easily to consult one another and to act in unison. Those committee members guessed that the dues named in our By-laws would cover the expenses of such a defensive movement. But we found this Association far too valuable to let it hibernate until some great common problem confronted our industry. What would have been the use of putting $8,000 or $10,000 annually into a quiescent, non-remunerative organization when, by expending a few thousand dollars more we can have an enterprise that gives us continually returns for our expenditure, enlarges our activities, contributes to the betterment of standards, reduces friction and abolishes misunderstandings between us and our competitors? While we formed this Association in March, 1915, our general secretary was not discovered and installed until July. None of us was willing to devote time and attention to our secretary's pleadings until we finished our summer outings, and so the formation of new sections began actively only in the fall and present winter months. Ten sections now organized represent tremendous labor expended, how great none but our secretary and counsel know.

The profits on our investment must come from the work those sections are yet to accomplish. Many more sections are waiting and until practically all sections are in running order we must consider that we still are in the organization period. Your Board of Governors forecasts the completion of this organization period in about another year.

Your general secretary in his report will tell you of some important connections already established between this Association and other bodies such as (1) the Federal Trade Commission, (2) the Bureau of Standards of our Federal Government, (3) the Underwriters' Laboratories, Incorporated.

You will remember that at our gathering on March 9, 1915, before this Association organized, and subsequently at the Bi-Annual Open Meeting of the Electrical Committee of the National Fire Protection Association a large and representative body of men was asked to study the question of grounded versus all insulated electrical circuits in American building construction, first as to safety to life, secondly as to safety from fire, and third as to possible methods of interior wiring of existing buildings which will be safe, inexpensive, and not unsightly.

Later I shall call upon Mr. LeRoy Clark to tell you of the work done and to be done by that large committee, whose members represent about one dozen manufacturing concerns and the following associations and institutions: American Institute of Electrical Engineers, Associated Factory Mutual Fire Insurance Companies, National Electrical Supply Jobbers' Association, International Association of Municipal Electricians, Massachusetts Institute of Technology, National Electrical Contractors' Association, National Electric Light Association, Bureau of Standards of our Federal Government, Western Association of Electrical Inspectors, Underwriters' Laboratories, Inc., and Associated Manufacturers of Electrical Supplies.

Some of our sections and their committees have met from time to time during this past year with representatives of the National Electric Light Association with subcommittees of the Standardization Committee of the American Institute of Electrical Engineers, and with other authoritative bodies for the discussion of subjects of mutual interest. In the coming year similar conferences will occur frequently and the decisions obtained will be of increasing importance and interest to the electrical industry.

Today the popular cry is for preparedness and synchronizing with the martial note in that call is the vibration of the industrial chord which interests you and me. Perhaps you observed in the public press a few weeks ago an article purporting to tell of an interview with a prominent engineer, who, if I remember rightly, was said to be an official of the American Institute of Mining Engineers. In that article was described a plan which provides that our various American engineering societies shall obtain from all manufacturers complete statistics as to their factory equipments, capacities for production, classes of goods now made and which possibly can be made with the machinery therein, and voluminous similar data.

To the Chief of Staff of the Army, the Secretary of War on February first last referred a letter in which your president with the approval of the Board of Governors told the Federal Government at Washington that our Association, by reason of its unique organization, is particularly well equipped to assemble from its members all such data as may be needed from the manufacturers of electrical supplies. Whether or not those statistics are ever demanded of us by our government, I submit for your consideration the thought that every member of this Association needs that kind of properly assembled data relative to his particular line of manufacture, summarized in such manner and under such assured privacy as will prevent improper disclosures about the equipments of individual or specific factories or plants. When pressure of much business tempts you to increase your facilities your judgment will err less often if you have that information. When scarcity of orders and extremely low prices distract you your business sense, which tells you to curtail production, will secure the poise which accompanies accurate knowledge of possible total production versus actual demand.

In public speeches in recent months members of the Federal Trade Commission, and notably Edward N. Hurley, vice-chairman of the Commission, have laid great emphasis upon the importance of common and united action by the members of such trade associations as ours "looking toward improving their processes of manufacture, standardizing their products, improving their systems of ascertaining costs, obtaining credit information," and the like. I commend all such activities to the thoughtful consideraion of our section members.

You are aware that the electrical manufacturers of this country are quite naturally divided into two great classes: (1) The manufacturers of electrical apparatus including generating machinery, transformers, motors, etc. (2) The manufacturers of electrical supplies and of materials entering into electrical construction. To the former the doors of the Electric Power Club are open. Our Association opens its doors to all of the latter class.

A third organization, the Electrical Manufacturers' Club, has gathered into intimate association with one another a large number of men who hold official positions of more or less importance in many of the manufacturing companies who are members, or are eligible to be members, of the Electric Power Club, or of the Associated Manufacturers of Electrical Supplies.

Manifestly co-ordination of the activities of the two standardizing associations, and non-duplication by one of the work accomplished in the other, are exceedingly important matters for both organizations.

All three of the organizations just mentioned ought to foster a lively, sympathetic and co-operative interest in the activities of each.

To provide a simple and useful medium of intercommunication those three organizations have appointed four representatives each, making twelve men in all, who now have organized the Electrical Manufacturers' Council.

Miscellaneous Business.

The reports of the treasurer, J. W. Perry, and of the general secretary, Charles E. Dustin, were read and accepted. From the secretary's report it was shown that the present number of member companies is 143, while executive and associate representatives number 215. There are now ten Sections in active operation: Fuse Section, Interior-Conduit Section, Knife-Switch Section, Lamp Receptacle and Socket Section, Molded or Formed-Insulation Section, Outlet-Box Section, Panelboard and Switchboard Section, Porcelain Section, Snap-Switch Section, Wire and Cable Section. Several new Sections are in process of formation, embracing Heating and Current-Consuming Devices, Electrical Fixtures, Fan Motors and other lines.

The chairmen of the various committees presented valuable reports of progress. Chairman LeRoy Clark, of the Committee on Concentric Wiring, stated that this form of wiring had met with only slight favor in limited fields. All the committee reports and those of officers, including the president's address in full, are to be printed and a copy sent to each member of the Association. It was announced that during the coming year it is planned to enlarge greatly the work of the Association, and permanent headquarters will be established in New York, with commodious conference and committee rooms.

The following-named gentlemen were elected Governors: For three years—LeRoy Clark, New York; J. W. Perry, New York; W. C. Robinson, Pittsburgh; J. J. Gibson, Pittsburgh, and Warren Ripple, South Bend, Ind.; for two years E. B. Hatch, Hartford, and L. W. Downs, Providence.

After adjournment of the general meeting the Governors met and elected the following officers for the ensuing year:

President, R. K. Sheppard.

Vice-president, H. B. Crouse.

Treasurer, J. W. Perry.

General secretary, Charles E. Dustin.

In the evening a banquet was held at Delmonico's, with a full attendance, and interesting addresses were delivered by Dr. Talcott Williams, of Columbia University, and J. A. Emery, of the National Association of Manufacturers.

The Associated Manufacturers of Electrical Supplies was organized a year ago, and numbers the following list of member companies, as of March 16, 1916:

List of Members.

A. A. Wire Company, Newark, N. J.; Adapti Manufacturing Company, Cleveland, Ohio; Alphaduct Company, Jersey City, N. J.; American Circular Loom Company, New York, N. Y.; The American Conduit Manufacturing Company, Pittsburgh, Pa.; Frank Adam Electric Company, St. Louis, Mo.; American Electric Works, Providence, R. I.; American Enameled Magnet Wire Company, Muskegon, Mich.; American Vulcanized Fibre Company, Wilmington, Del.; Appleton Electric Company, Chicago, Ill.; Ansonia Electrical Company, Ansonia, Conn.; The Arrow Electric Company, Hartford, Conn.; Atlantic Insulated Wire & Cable Company, New York, N. Y.; Belden Manufacturing Company, Chicago, Ill.; Benjamin Electric Manufacturing Company, Chicago, Ill.; Best Electric Company, Pittsburgh, Pa.; Bishop Gutta Percha Company, New York, N. Y.; Black & Boyd Manufacturing Company, New York, N. Y.; The W. A. Bonnell Company, New York, N. Y.; Boston Insulated Wire & Cable Company, Dorchester District, Boston, Mass.; Boonton Rubber Manufacturing Company, Boonton, N. J.; Bourn Rubber Company, Providence, R. I.; James F. Burns, Philadelphia, Pa.; The Bryant Electric Company, Bridgeport, Conn.; Cassidy & Son Manufacturing Company, New York; Edward T. Caldwell & Company, New York; Central Tube Company, Pittsburgh, Pa.; Chase-Shawmut Company, Newburyport, Mass.; Chicago Fuse Manufacturing Company, Chicago, Ill.; Chicago Insulated Wire & Manufacturing Company, Chicago, Ill.; The Colonial Sign & Insulator Company, Akron, Ohio; Collyer Insulated Wire Company, Pawtucket, R. I.; Condit Electric Manufacturing Company, Boston, Mass.; The Connecticut Electric Manufacturing Company, Bridgeport, Conn.; Crescent Insulated Wire & Cable Company, Trenton, N. J.; Crouse-Hinds Company, Syracuse, N. Y.; Cuthbert Electric Manufacturing Company, Chicago, Ill.; The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.; George Cutter Company, South Bend, Ind.; Cook Pottery Company, Trenton, N. J.; D & W Fuse Company, Providence, R. I.; Detroit Fuse & Manufacturing Co., Detroit, Mich.; Detroit Insulated Wire Company, Detroit, Mich.; Dickinson Manufacturing Company, Springfield, Mass.; Duranoid Manufacturing Company, Newark, N. J.; Eastern Flexible Conduit Company, Brooklyn, N. Y.; The Electric Cable Company, New York, N. Y.; The Electric Storage Battery Company, Philadelphia, Pa.; Electrose Manufacturing Company, Brooklyn, N. Y.; Enameled Metals Company, Pittsburgh, Pa.; Empire China Works, Brooklyn, N. Y.; I. P. Frink, New York; Freeman Electric Company, Trenton, N. J.; General Bakelite Company, New York; General Electric Company, Schenectady, N. Y.; General Insulate Company, Brooklyn, N. Y.; B. F. Goodrich Company, Akron, Ohio; Habirshaw Wire Company, Yonkers, N. Y.; Hart & Hegeman Manufacturing Company, Hartford, Conn.; Hart Manufacturing Company, Hartford, Conn.; Harter Manufacturing Company, Chicago, Ill.; Hartford Faience Company, Hartford, Conn.; Hazard Manufacturing Company, Wilkes-Barre, Pa.; Hemming Manufacturing Company, Garfield, N. J.; Hotpoint Electric Heating Company, Ontario, Cal.; Harvey Hubbell, Inc., Bridgeport, Conn.; Illinois Electric Porcelain Company, Macomb, Ill.; Imperial Porcelain Works, Trenton, N. J.; Indiana Rubber & Insulated Wire Company, Jonesboro, Ind.; Industrial Controller Company, Milwaukee, Wis.; H. W. Johns-Manville Company, New York, N. Y.; Johns-Pratt Company, Hartford, Conn.; Keasbey & Mattison, Ambler, Pa.; Kerite Insulated Wire & Cable Company, New York, N. Y.; Killark Electric Manufacturing Company, St. Louis, Mo.; The Krantz Manufacturing Company, Brooklyn, N. Y.; Locke Insulator Manufacturing Company, Victor, N. Y.; J. B. McCoy & Son, New York; The Macallan Company, Boston, Mass.; Manhattan Electrical Supply Company, New York, N. Y.; Marconi Wireless Telegraph Company, New York, N. Y.; Mark Manufacturing Company, Evanston, Ill.; Marion Insulated Wire & Rubber Company, Marion, Ind.; Metropolitan Electric Manufacturing Company, Long Island City, N. Y.; Metropolitan Engineering Company, New York, N. Y.; Alfred F. Moore, Philadelphia, Pa.; Mutual Electric & Machine Company, Detroit, Mich.; National India Rubber Company, Bristol, R. I.; National Carbon Company, Cleveland, Ohio; National Metal Molding Company, Pittsburgh, Pa.; Newton Manufacturing Company, Lynbrook, L. I.; New York Insulated Wire Company, New York, N. Y.; Northern Electric Company, Ltd.; Montreal, P. Q., Can.; Nungesser Carbon & Battery Company, Cleveland, O.; Nyelec Switchboard Company, New York, N. Y.; Ohio Brass Company, Mansfield, O.; Otis Elevator Company, New York, N. Y.; The Okonite Company, New York, N. Y.; W. R. Ostrander & Company, New York, N. Y.; Overbagh & Ayers Manufacturing Company, Chicago, Ill.; The H. T. Paiste Company, Philadelphia, Pa.; Palmers & DeMooy Foundry Company, Cleveland, O.; Pass & Seymour, Inc., Solvay, N. Y.; Perkins Electric Switch & Manufacturing Company, Bridgeport, Conn.; Phillips Insulated Wire Company, Pawtucket, R. I.; Pittsburgh High Voltage Insulator Company, Derry, Pa.; Pittsburgh Lamp, Brass & Glass Company, Pittsburgh, Pa.; Plume & Atwood Manufacturing Company, Waterbury, Conn.; Portland Monson Slate Company, Portland, Me.; Pratt-Chuck Company, Frankfort, N. Y.; Pringle Electrical Manufacturing Company, Philadelphia, Pa.; L. Plaut & Company, New York; J. A. Roeblings Sons Company, Trenton, N. J.; Rome Wire Company, Rome, N. Y.; Safety Armorite Conduit Company, Pittsburgh, Pa.; Safety Insulated Wire & Cable Company, New York, N. Y.; Saylor Electric & Manufacturing Company, Pittsburgh, Pa.; Siemon Hard Rubber Corporation, Bridgeport, Conn.; Simplex Wire & Cable Company; Boston, Mass.; Standard Underground Cable Company, Pittsburgh, Pa.; Star Porcelain Company, Trenton, N. J.; Steel City Electric Company, Pittsburgh, Pa.; Sterling Bronze Company, New York; Tabulating Machine Company, Washington, D. C.; Thomas & Betts Company, New York, N. Y.; R. Thomas & Sons Company, East Liverpool, Ohio; Thompson Electric Company, Cleveland, Ohio; Trenton Electric & Conduit Company, Trenton, N. J.; E. T. Trotter & Company, Brooklyn, N. Y.; Trumbull Electric Manufacturing Company, Plainville, Conn.; Tubular Woven Fabric Company, Pawtucket, R. I.; Union Electric Company, Trenton, N. J.; V. V. Fittings Company, Philadelphia, Pa.; Waterbury Button Company, Waterbury, Conn.; Weber Electric Company, Schenectady, N. Y.; Western Electric Company, New York, N. Y.; Wakefield Brass Company, Vermilion, Ohio; Western Conduit Company, Youngstown, Ohio; The Wirt Company, Philadelphia, Pa.; Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.; Wm. Wurdack Electric Manufacturing Company, St. Louis, Mo.; Waclark Wire Company, New York; Yost Electric Manufacturing Company, Toledo, Ohio.

The Board of Governors now consists of the following gentlemen, representing the companies named:

A. W. Berresford, Cutler-Hammer Manufacturing Company, Milwaukee, Wis.; Charles Blizard, Electric Storage Battery Company, Philadelphia, Pa.; LeRoy Clark, Safety Insulated Wire & Cable Company, New York; H. B. Crouse, Crouse-Hinds Company, Syracuse, N. Y.; D. C. Durland, Sprague Electric Works, General Electric Company, New York; J. J. Gibson, Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.; H. Holmes, R. Thomas & Sons Company, East Liverpool, Ohio; J. F. Kerlin, National Carbon Company, Cleveland, Ohio; J. W. Perry, H. W. Johns-Manville Company, New York; W. C. Robinson, National Metal Molding Company, Pittsburgh, Pa.; B. E. Salisbury, Pass & Seymour, Inc., Solvay, New York; R. K. Sheppard, Simplex Wire & Cable Company, Boston, Mass.; E. B. Hatch, Johns-Pratt Company, Hartford, Conn.; L. W. Downes, D. & W. Fuse Company, Providence, R. I.; Warren Ripple, George Cutler Company, South Bend, Ind. Thomas M. Debevoise is general counsel.

Miscellaneous NEWS NOTES

Directory of Electricians in Massachusetts.—A 220-page booklet, giving the names and addresses of licensed electricians of both the Masters' (Class A) and the Journeymen's (Class B) grades has been issued by the State Board of Electrical Examiners of Massachusetts. The list is arranged by cities and towns, and is a convenient handbook for use in checking up authorized electricians in the state. The laws relating to the licensing of electrical workers are also presented.

Frank J. Sprague Addresses New York Electrical Society.—At the meeting of the New York Electrical Society held the evening of March 24, Frank J. Sprague, who is an ex-officer of the United States Navy, delivered an address entitled "A Month With the Atlantic Fleet During Battle Maneuvers, Drills and Target Practice." The information upon which this address was based was obtained on a trip undertaken by Mr. Sprague in his official capacity as a member of the recently organized Naval Consulting Board.

New Orleans Jovians to Hold Electric Show.—Plans are being rapidly completed for a comprehensive electrical show to be given by the New Orleans Jovian League on April 10 to 15. W. E. Clement is chairman of the committee on arrangements and states that much enthusiasm has already been aroused and that New Orleans manufacturers and dealers of electrical supplies and appliances have all pledged their support and many out-of-town dealers have indicated a desire to maintain extensive exhibits.

City Purchases Light Plant.—An agreement has been reached between the City Commission of Pratt, Kans., and the representatives of the Pratt Light Company, providing for the taking over of the latter's electrical distribution system, together with all poles, switchboards, engines, generators and other electrical appratus. The city will pay $23,000 to the old-plant stockholders for the electrical properties and in addition the franchise under which the company now operates will be canceled. An approval of this action will be sought at the regular spring election, at which time, the city will be asked to vote on the proposed bonds.

American Institute Nominees.—The Board of Directors of the American Institute of Electrical Engineers has selected the following names as "directors nominees" for election of officers for the next fiscal year beginning August 1, 1916: President, H. W. Buck, New York City; vice-presidents (three to be elected), L. T. Robinson, Schenectady, N. Y., Peter Junkersfeld, Chicago, Ill., B. A. Behrend, Boston, Mass., Henry A. Lardner, New York City; managers (four to be elected), John B. Fisken, Spokane, Wash., Charles Robbins, Pittsburgh, Pa., N. A. Carle, Newark, N. J., Charles S. Ruffner, St. Louis, Mo.; treasurer, George A. Hamilton, Elizabeth, N. J.

Tablets Commemorating Telephone Inception Dedicated at Boston.—Two bronze tablets marking the site of the buildings in which the telephone was developed, at Boston, Mass., were dedicated March 13 by Alexander Graham Bell. One tablet is located on the front of a theater at 109 Court Street, where stood the building in which the early experiments of Dr. Bell and his associates were carried on; and the other tablet is on the building at 5 Exeter Place, where the first words were transmitted over a telephone wire. The tablets were erected by the Bostonian Society and the New England Telephone & Telegraph Company. In the evening of March 13 Dr. Bell addressed a large audience at the City Club, recounting the early struggles and the wonderful development of the telephone industry.

Detroit Edison Company Publishes House Organ.—The Detroit Edison Company has inaugurated the publication of a monthly house organ which is termed the "Synchroscope" and which, it is stated, will deal with all inter-departmental activities of the company. The March issue contains an interesting article on "Load-Water-Rate Curves Applied to Plant Operation," by W. A. Hirt, and an article on electric steel furnaces by E. L. Crosby. The company's pulmotor service and the testing and research laboratories are also described.

Generation of Energy by Steam Twice as Costly as by Water Power.—The city of Seattle's municipal lighting plant paid $56,160.16 for the generation of energy at the hydroelectric power plant at Cedar Falls, and $112,466.26 for the generation of energy at the Lake Union steam auxiliary plant in Seattle. According to a report of the Bureau of Inspection and Supervision of Public Offices at Olympia, the cost of generating by steam in the case of the city of Seattle was twice as expensive as generating by water during the year 1915.

Street Railway Commissioner Advocated for Minneapolis.—Creation of the office of Street Railway Commissioner, to which only a technically educated man would be eligible, to look after the city's interest under the proposed new street-railway franchise of Minneapolis, Minn., was advocated by Charles L. Pillsbury, consulting engineer, in an address to the Central Franchise Committee at the Dyckman Hotel, Minneapolis, on March 14. Mr. Pillsbury, whose company is working on the valuation of the utilities of Washton, D. C., in the course of his address presented to the committee the main factors that he believed should enter into the franchise provisions in regard to service, rates and values.

New Electrolytic Plant at Boston.—The Boston Electrolytic Oxygen Company, a new enterprise organized by Tenney interests, has been incorporated with a capital stock of $150,000 and has begun the manufacture of compressed oxygen and hydrogen gases at works in Everett, Mass.

The process, which is covered by patents giving the company rights for the United States and its possessions, consists of electrolysis of distilled water which produces oxygen guaranteed 99.3 per cent pure and hydrogen 99.9 per cent pure. The oxygen gas is compressed in metal cylinder tanks and distributed by auto trucks in the Boston territory.

Rejuvenation in Louisville.—A Jovian rejuvenation was held at Louisville, Ky., on March 17, at the Seelbach Hotel, at which the 42 candidates were initiated. The ceremonies followed the annual banquet of the organization, at which the candidates were guests. Robert Montgomery, First Tribune, presided as toastmaster, and introduced Donald McDonald, vice-president and general manager of the Louisville Gas & Electric Company; Frank H. Miller, president of the Jovian League; Judge Matt O'Doherty, counsel for the Gas & Electric Company, and James Clark, Jr., one of the first of the Kentucky Jovians, who all made talks.

Arrangements for Ohio State Electrical Show.—The Ohio State Electrical Show will be held April 27, 28, 29, 1916, at Columbus, O. The best engineering companies of the country will be represented and their exhibits will give the public the opportunity of comparing advantages and disadvantage, developments and improvements of everything electrical. Lectures will be given on high-frequency work, modern inventions, X-Ray and other subjects which every one desires to know more about. This show which is given only once every two years is held under the auspices of the Ohio State University, Columbus, O.

Electric Heating of a Canadian Residence

President of the Ottawa Electric Company, a Pioneer in Electric Heating, Has Equipped His Residence With Exclusively Electric Heating System—Complete Satisfaction and Uniform Temperature Result—Description of Equipment Used

The electrical heating of residences has received little attention in the eastern portion of the United States and Canada, as the general availability of cheap fuel in these districts has made electric heating seem too expensive a proposition for consideration. This feature has not, however, prevented experimentation along this line and one of the pioneers in this field, Thomas Ahearn, of Ottawa, Canada, has completely equipped his home with electric heating apparatus.

Mr. Ahearn is a pioneer inventor of electric heating devices. Some of his early work along this line was described in the WESTERN ELECTRICIAN for July 23 and October 22, 1892. At that time Mr. Ahearn equipped the electric street cars of Ottawa nrst with electric heaters using a hot-water distributing system, and later with electric air heaters. Electric heating equipment for supplying hot water for the use of barbers, druggists and even for household purposes was installed at that time, the equipment being manufactured by the firm of Ahearn & Soper, Limited. Mr. Ahearn also installed some heating equipment in his residence about the same time, reference to which will be made later.

Not finding very great commercial possibilities for electric heating at that time, this branch of the firm's business was not given very much attention, although electric cooking apparatus was designed and an exhibit of such apparatus was awarded a gold medal in 1892 by the Exhibition Association of Central Canada. The front of this medal is shown in Fig. 6. Upon the other side of the medal appears the following inscription: "Awarded to T. Ahearn for exhibit of electric cooking and heating devices." This exhibit was a working demonstration and specimens of the products of the electric oven were distributed to visitors. About the same time, namely, on August 29, 1892, an electric dinner was served at the Hotel Windsor, Ottawa, every item of which was cooked by the heating appliances of Mr. Ahearn. The bread and meats were cooked in an electric oven and the liquids in other electric heaters. The apparatus was installed at this time in the building of the Ottawa Traction Company, in which also Messrs. Ahearn and Soper were interested. They also introduced electric street cars into Ottawa. Mr. Ahearn was at that time and still continues to be president of the Traction Company. He has also been largely interested in the development of Ottawa's other utilities and is president of the Ottawa Electric Company, the Ottawa Gas Company, the Ottawa Light, Heat & Power Company, the Ottawa Car Manufacturing Company, and has a number of other business connections.

Mr. Ahearn decided to heat his home entirely by electricity during the present winter and for that purpose installed in his residence a number of air heaters of the type manufactured by the Consolidated Car Heating Company. This residence, which is a large detached house shown in Fig. 3, was formerly heated by steam. The house steam plant was shut down and has not been in use during the present winter.

The electric heating system employed involves three different elements. In the first place, there are a number of the old electric heaters made in the early days by Ahearn & Soper. These are cylindrical in shape with the axis vertical, and are designed to induce a current of air through

Fig. 1.—Library With Electric Heater Under Window and Control Switch to Left.

Fig. 2.—Hot-Water Radiator in Hall and Electric Heater in Drawing-Room.

Fig. 3.—Exterior of Mr. Ahearn's Residence.

an opening through the bottom of the heater, the air becoming heated during its passage. There are eight of these small heaters now in service, each taking about 6.5 amperes from the 107-volt lighting circuit.

The new air heaters which were installed last fall are 17 in number and are connected to a special circuit supplied by an individual transformer, which is mounted upon a pole outside of the building, service being brought into the basement through an underground cable. This cable terminates at the panelboard shown in Fig. 5. This panelboard provides for 20 local circuits, each supplied with a switch and fuses. These circuits are wired in conduit which can be seen just above the cabinet, and a blueprint on the cabinet door indicates the location of the heater attached to each one of the outgoing circuits. Each of these heaters has four elements in parallel, each element taking approximately five amperes. A gang switch permits any desired number of these elements to be utilized at any time. One of these heaters is installed under the front window of the library on the first floor, shown in Fig. 1. The flush switch, just referred to, may be seen to the left of the window. In a number of the rooms, the heaters are placed in a similar manner, under the windows, but in certain of the rooms they are mounted in the room away from the wall. In every case the heater is supplied with a deflector which throws the hot air forward. For the heaters mounted in the wall as shown in the library, a double deflector is provided, with an air space between the two sheets of metal.

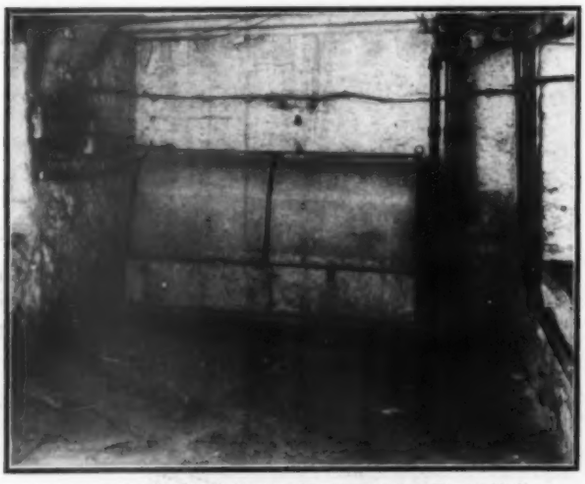


Fig. 4.—Electric Hot-Water Heater Under Front Hall, Installed in 1895.

This is intended to prevent a loss of hot air which might find its way into the wall between the stonework and interior finish.

The third element in the heating system consists of the hot-water radiators in the front hall, supplied with hot water from an electric heater in the basement. The basement heater is shown in Fig. 4 and was installed in 1895. It is supplied from a 550-volt street-railway circuit through the switch shown in the left of this illustration. There are two elements in this heater, each taking approximately six amperes. One of the radiators is shown in Fig. 2. The doorway shown in this figure leads from the hall into the drawing room. Under the window of the drawing room is an air heater similar to that installed in the library. The other window seen to the left is still equipped with an unused steam radiator.

This electric heating system has given excellent satisfaction, the house being kept at a comfortable temperature in all kinds of weather. The only attention required is the occasional changing of a switch by simply pushing the button, in case it is found the amount of energy being used is not suited to the prevailing weather. Ottawa experiences severe winter weather at times, but it has not been found necessary to use the entire capacity of the heating system at any time. Most of the switches are set during midwinter with three elements of the heater in use, although some are utilized at one-half capacity. A very uniform temperature is maintained in the house night and day, as is evidenced by the records of a recording thermometer which is kept in operation in the library. Each record covers operation for one week and one of these records is shown in Fig. 8. The record runs from February 17 to February 24, 1916, with an overlap of a few hours. The outdoor temperature during one night of this week (Sunday, February 20) reached 20 degrees Fahrenheit below zero. Nevertheless, the temperature varied only between the limtis of 68 and 75 degrees, with the exception of one day when a gas log in the room was ignited. Upon this occasion the temperature rose in one hour from 70 to 77 degrees. It soon

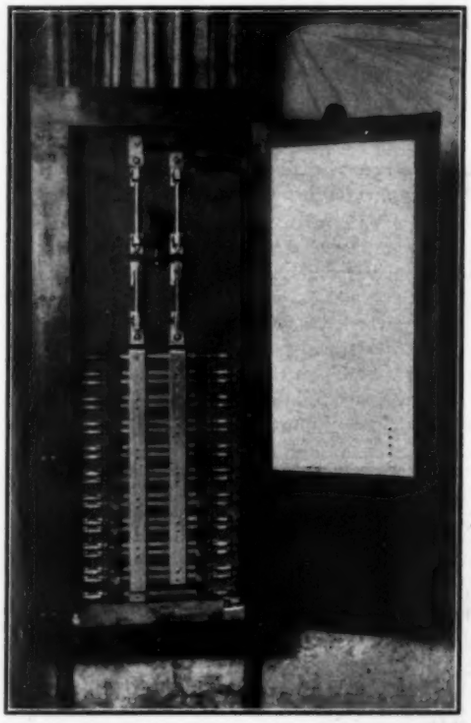


Fig. 5.—Panelboard for Heating Circuits.

returned to 71 degrees when the gas grate was shut off.

It is Mr. Ahearn's idea that electric heating should be supplemented by some other form of heating such as that supplied by gas logs. This supplementary heating would come into use during the extreme peaks of cold weather. The capacity of the electric equipment need not consequently be sufficient to take care of these peaks, but could be designed for average winter weather. This would not only reduce the first cost of the equipment but would reduce the maximum demand of the system. Since the latter element has come to be an important item in most systems of charging for electric energy, this is a very practical consideration and would, no doubt, greatly influence the cost of electric heating. The installation of Mr. Ahearn is of a trial nature and is paid for by a special flat rate. The Ottawa Electric Company has not yet decided upon a schedule of charges for this service and although very low rates are offered by the company for both domestic service and power, the cost for electric heating on the same basis would be generally found prohibitive. The Ottawa Electric Company generates power in a hydroelectric plant located upon the Ottawa River within the city. It is also equipped with a steam reserve station, which is only called into service during periods of low water or other interruptions of operation in the hydroelectric station. The special flat rate which has been given Mr. Ahearn is conditioned upon the use of auxiliary heating (such as gas logs) during periods when the steam reserve station may be called into operation, as only a minimum consumption of electric energy will be permitted to him at such times.

Fig. 6.—Medal for Electric Heating Apparatus.

As stated above, the maximum capacity of Mr. Ahearn's installation has never been required. A measurement made at the panelboard showed a total consumption when all switches were closed of 394 amperes at starting and 350 amperes after operation for 20 minutes. Using the latter figure, and noting that the pressure upon this special circuit is 112 volts, we find the total capacity of this set of heaters to be 39,200 watts. The eight smaller heaters previously referred to take 6.5 amperes at 107 volts or 5,560 watts. The water heater which supplies the hot-water radiators consumes 6,600 watts. The total capacity for the entire house is consequently slightly over 51 kilowatts. The third floor, which is occupied by a billiard room, is not separately heated. It is found that sufficient warm air circulates up here from the lower floors to make separate heating unnecessary. The cubical content of the first two floors of the house amounts to 53,000 cubic feet. The installed capacity is thus slightly less than one watt per cubic foot, and as noted above, the entire capacity has not been required, even in the most severe weather. In this connection it should be remembered that this building is unusually well constructed, with outer walls of stone, giving good heat insulation. Moreover, a house of this size has less surface exposed per unit of volume than would be the case for a smaller residence, and the latter would consequently require greater capacity in the heaters per unit volume.

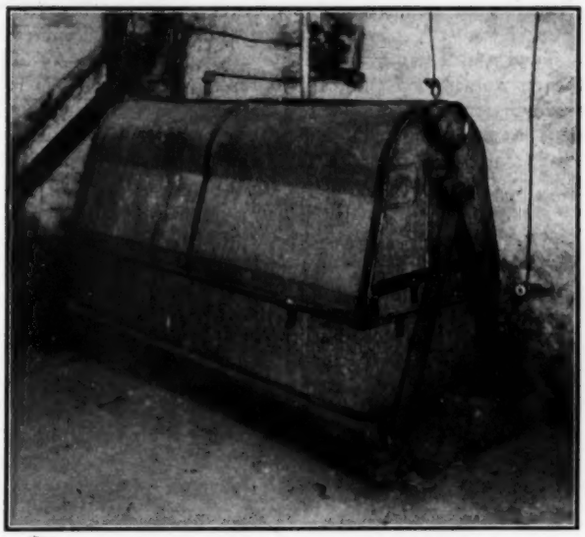


Fig. 7.—Electric Heater for Household Water Supply.

Measurement of the energy consumption for the months of March and April is being made by watt-hour meter, and this will give data as to the requirements during the more moderate weather of the spring months. Combined with the data above it will give a knowledge of the entire winter's requirements, and the result will be of great interest as affecting the commercial practicability of house heating in this territory. No doubt can exist as to its feasibility when the satisfactory results in Mr. Ahearn's residence are considered.

Hot water for household purposes is also supplied in Mr. Ahearn's residence through the medium of electric heating. An ordinary kitchen boiler is mounted horizontally in the basement and two electric heaters have been placed underneath it. Each of these heaters uses six amperes from the electric railway circuit above mentioned. The entire outfit is inclosed in a double case of sheet metal and is shown in Fig. 7. This equipment was installed in the basement in 1894 and has been in continual use since then, giving entire satisfaction and plenty of hot water. A thermometer mounted upon the end of the inclosure indicates the temperature of the air surrounding the boiler as 240 degrees Fahrenheit. This temperature is considerably above the boiling point of water.

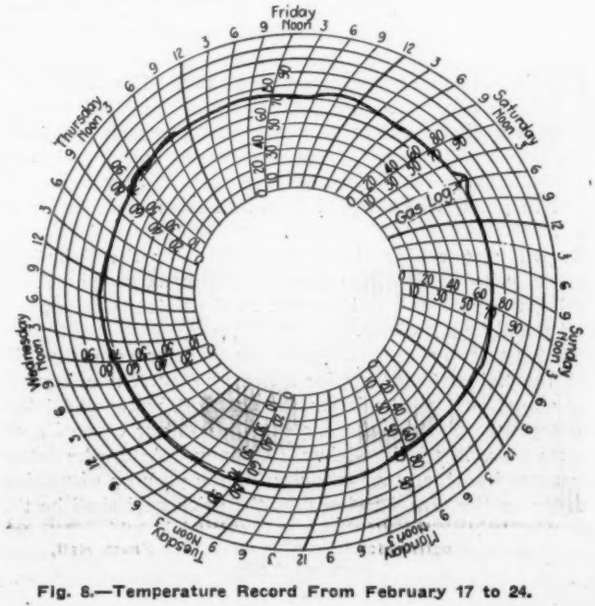


Fig. 8.—Temperature Record From February 17 to 24.

The electric bell circuits in the house are supplied from a storage battery which is mounted in the basement and equipped with a lamp bank for charging purposes. As Mr. Ahearn was at one time a telegraph operator, he has retained his interest in this use of the electric current and keeps a set of instruments within easy reach upon his library table, connected by line with the residences of Warren Y. Soper and James D. Fraser, two of his business associates who were also old-time telegraphers. Mr. Fraser is secretary-treasurer of several of the Ahearn-Soper corporations. The line also gives connection with the offices of the various companies in which Messrs. Ahearn and Soper are interested. They find this method of communication more attractive than the telephone, although the latter stands ready at hand and of course must be used for communicating with persons unfamiliar with the Morse code. By having this telegraph circuit looped in with the Associated Press line during the evening hours, these gentlemen get the benefit of this news service many hours before it appears in the morning newspapers and through a medium which to them is more agreeable than reading.

TRANSMISSION LINE TO CONNECT MASSACHUSETTS CENTRAL STATIONS.

Important Development in New England Providing for Centralization of Supply.

The proposal of the Eastern Massachusetts Electric Company, a newly organized corporation allied with Charles H. Tenney & Company, Boston, to construct a high-tension transmission line in Massachusetts, to connect the Salem Electric Lighting Company's plant with that of the Malden Electric Company, Malden, and the Suburban Gas & Electric Company, Revere, Mass., contemplates the building of a steel tower line about nine miles in length through Salem, Peabody, Lynn, Lynnfield, Wakefield, Saugus and Melrose, and the installation of cables in underground conduits of the Suburban and Malden companies, thus providing a physical connection of the three plants, for operation at 22,000 volts.

The three companies mentioned are under the engineering management of the Tenney Company and the Eastern Massachusetts Electric Company is identified with that concern, its officers being members of the Tenney organization. The capital stock is $250,000.

Owing to the very favorable location of the Salem Company's plant at tide water and its capacity, due to the large power load it has under contract, it is proposed to sell energy to the Eastern Massachusetts Electric Company, which is purely a transmission company. The latter will market the current to the Suburban and the Malden companies, enabling them to purchase it at a considerably less cost than their present production costs, and to take on increased business without making further capital investment in plant, which would become necessary at an early date.

It will also enable either the Malden or the Suburban Company to operate the present plants at certain times during the year and sell current to the Salem Company if load conditions warrant.

Under tentative contracts, the transmission company will pay the Salem Company for all surplus current generated the actual cost to the latter for coal, oil, water and labor employed to produce the current, plus 10 per cent of such cost as profit to the Salem Company. After the latter increases its generating capacity for the purpose of putting energy on the transmission line, the price paid shall be the manufacturing cost plus 10 per cent and in addition 7 per cent interest on the part of plant and equipment maintained for producing the current sold to the transmission company, and all maintenance, depreciation and incidental charges on that account. The cost of current generated by the Salem plant is now as follows, per kilowatt-hour:

Fuel, $0.005; handling, $0.00095; water, $0.00024; lubricants, $0.0001; total, $0.005435. Adding 10 per cent gives a total cost of $0.005978.

A contract with the Malden Electric Company calls for the use of about 10,800,000 kilowatt-hours, the price paid the transmission company to be $0.009 per kilowatt-hour. The Suburban Gas & Electric Company would buy about 3,850,000 kilowatt-hours, at the price of $0.0115 per kilowatt-hour. On this basis the Salem Company would receive $87,900 per year, representing a profit of about $8,277.

It is planned to keep the Malden and Suburban plants in repair as auxiliaries and for use in emergencies.

The present cost of energy generated at the Malden station is 1.05 cents a kilowatt hour. At the price paid the transmission company it would be $0.00985, representing a saving of $0.00065 per kilowatt-hour or about $7,200 per year. The following would be the added items of production cost of energy furnished the Malden Company:

Station superintendence and care	$2,000
Three switchboard men at $20 each per week	3,120
Two extra men at $15 each per week	1,560
Fuel	500
Light and miscellaneous expenses	500
Repairs	1,500
	$9,180
Divided by 10,800,000 kilowatt-hours	.00085
Cost of energy purchased	.00900
Total	$0.00985

The maximum load conditions at the Malden plant are about 3,500 kilowatts, and the normal rating about 3,300 kilowatts. The company has signed a contract for nearly 1,000 kilowatts additional load, which necessitates either increased generating facilities or procuring energy from another source.

The estimated cost of the purchased energy supplied the Suburban Company is $0.01383, representing a saving of $0.00077 over present cost, or about $2,695 per year. The only added items of cost would be about $250 for station fuel and $750 for repairs. The load is about 1,900 kilowatts at this plant, and the normal rating 1,440 kilowatts. Energy is now purchased of the Malden Company to care for overload conditions during the summer, when the beach business taxes the plant.

Income and investment of the Eastern Massachusetts Electric Company would be as follows:

Total investment for right of way, engineering expenses and construction	$250,000
Estimated net income from Malden Electric Company	90,000
Estimated net income from Suburban Company	40,250
Total	$130,250

Operating Expense.

Current purchased, 14,650,000 kilowatt-hours at $0.006	$87,900
Labor	8,000
Repairs	1,000
Taxes, 2 per cent on $200,000	5,000
Insurance, fire, employee and public	1,000
Depreciation on $200,000 at 5 per cent	10,000
Interest on $250,000 at 6 per cent	15,000
Total	$127,900
Net income	2,350

The transmission line will consist of 140 double-circuit steel towers carrying six No. 00 stranded copper wires, with five-sixteenth-inch steel stranded ground cables. The average spacing of towers will be 450 feet. Structural line materials are estimated to cost $18,250, foundations $3,300, labor of erection $8,800, conductors and transmission material $29,000, overhead fixtures $3,300, underground transmission line $61,771, cable between the Salem plant and terminal house, $25,049, cable between Malden plant and Revere plant, $53,196. Total, $202,666. Incidentals and contingencies at 5 per cent and engineering at 5 per cent bring the total to $223,439.

COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Results Obtained from Kitchen Service Installations in Dayton.

The progressive manager or head of the commercial department of an electric light company in any community is not satisfied in having meters installed in all the new buildings erected in his territory, but is conducting campaigns for the wiring of already-built houses and making sure that unwired buildings are decreasing rapidly in his town. The "panel board" as an entering wedge for wiring business has proved very popular and many companies have adopted some form service of this character. As explained by Thomas F. Kelly, commercial manager of the Dayton (O.) Power & Light Company, before the Ohio New-Business convention the Kitchen Service campaign inaugurated April 19, 1916, has been very successful. The Dayton "Electric Kitchen Service" consists of one key-socket drop cord with a 40-watt Mazda lamp and one side-wall outlet, and a six-pound electric iron, all complete and ready for use for $10.98 cash. The wires enter the premises in metal conduit. The wiring is all concealed. The meter and fuse box are set according to standard practice in the cellar and the box has sufficient capacity to accommodate the future permanent wiring.

The proposition was introduced through advertising in the newspapers and a two-color four-page folder, which was distributed through personal visits of residence salesmen on prospects. The order for an "Electric Kitchen Service" is secured by the salesmen and is turned over to the contractor, who satisfies himself regarding the credit and collects from the customer when the work is completed. While the campaign was given special attention for a short time after its introduction—no long drawn-out campaign with special effort has been inforce and therefore the proposition has simply been a wedge to get electric service introduced into a home when other efforts failed.

As to the results obtained from the kitchen-service installations, the contracts closed for this business are a small portion of the business obtained through this proposition. Since the "Electric Kitchen Service" proposition was placed on the market, that is during the past ten months, 1,276 old houses have been wired in Dayton for electric service but the records do not show how many owners became interested first in the Kitchen Service proposition, and then through salesmanship and the opportunity thus afforded, were convinced that the proper thing to do would be to wire their house for complete electric service.

The possibility of securing that household necessity—an electric iron, all wired up complete for $10.98, interested tenants and owners alike and many a tenant "got after" the owner of his property and had it made modern.

From the books of the electrical contractor who is cooperating with the Dayton Power & Light Company on this proposition, it is found that approximately 25 per cent of the "Electric Kitchen Service" customers have spent amounts from 75 cents to $26.47 with the contractor in addition to the $10.98. People, who after they had signed the kitchen-service contract, decided at the solicitation of the representative of the electrical contractor to wire their entire house, are not considered electrical-kitchen-service customers.

Unfortunately, the proposition has not been in existence one year and therefore it is impossible to give the annual revenue from any of these customers, although the average monthly revenue taking about 20 per cent of the total customers as an average has been during the past nine months $1.08 per customer.

There is no record of any kitchen-service customers having completed the wiring of their home since the meter was installed although it is possible that some have.

New England Companies Inaugurate House-wiring Campaigns.

The Manchester (N. H.) Traction, Light & Power Company took cognizance of house-wiring month by inserting in local newspapers a whole-page advertisement setting forth its special wiring offer to owners of houses on the company's lines.

The company offered to connect the residence with service, set the meter and install entrance switch, wire and install a front porch or front hall light with push-button switch and 40-watt Mazda lamp, a cellar light controlled by a snap switch and provided with a 60-watt Gem lamp; to wire and install a flatiron outlet in the kitchen or laundry and supply a Perfection electric iron, all for $15, $5 to be paid on signing the contract and the balance "as suits your convenience." The work is sublet by the company to any local contractor in good standing whom the customer may designate.

The Narragansett Electric Light Company, Providence, R. I., inaugurated a new plan for house-wiring. An eight-light installation, complete with fixtures, shades, Mazda lamps and a six-pound Hotpoint electric flatiron, is provided for $49.94, only $4.99 being required as first payment and $3.75 per month for 12 months.

With the use of other styles of fixtures and added lights, contracts up to $75 are payable in 12 months, from $75 to $150 in 18 months, and over $150 in 24 months. The first payment in each case is 10 per cent of the whole. Wiring is all concealed work.

Electric Range Campaign by the Boston Edison Company.

Although the Boston Edison Company has sold some 400 electric ranges since late fall, the real electric range campaign will be begun April 1 and continue until July 1, the summer being the favorable season for electric cooking. A continuous range demonstration will be conducted at the Boylston Street salesrooms, with three expert demonstrators in charge, and a two or three weeks' demonstration will be carried on at each of the company's 16 other stores.

The advertising department is sending to a select list of about 1,500 prospects an announcement of these demonstrations, followed weekly for six weeks by special booklets and letters on electric ranges. Placards will be posted in 4,500 street cars, calling attention to the fact that "The electric range is now standard equipment for all up-to-date apartment buildings."

Newspaper Advertising for Central Stations

By Charles H. Seaver

How to make advertising copy attractive and productive is a question that is too frequently neglected by the central station. In this article, which is the second of a series on central-station advertising, some valuable suggestions are offered and general principles of good copy writing discussed. Another article by Mr. Seaver will appear in an early issue.

The life of a newspaper advertisement is short at best. Few people keep a daily newspaper more than a day or two, and fewer still refer to it after the day of its publication is past. Most readers have formed the habit of getting news from a paper quickly and answering advertisements promptly, when the advertisement appeals and the way to a response has been made easy. Attention must be caught and action secured at once, or the copy is valueless as a means of securing direct replies.

This rapidly passing value, which is common to all daily newspapers, makes it necessary to take advantage of news items promptly if any advertising value is to be gained from them. The installation of motors of unusual size or character; some quick resumption of service after a storm, or the rapid placing of a motor to do the work of a disabled engine, can all be worked into advertising that has distinct good will and educational value. How well this can be done may be seen from the advertisement shown in Fig. 1. Here a good deal of interest is attached to a construction detail of a large company. It is told in words that do not need to be explained to any one. The picture has an unquestionable educational value. Such an advertisement takes the public into the company's confidence, and does much to combat the old idea that a public utility moves in dark and mysterious ways.

Changes in rates are always interesting, as is anything that directly affects the user's pocketbook. Still the presentation of even such a prosaic thing as rates can be made in such a way that it will seem even more vital to him. One company has done this with a diagram in which the point is made, not that the same light may be had for less money, but that a steadily increasing amount of light may be bought for the same expenditure as in former years. The same company also explained reasonable variation in its customers' light bills with the chart, Fig. 2. One of the best testimonials of the merit of this advertisement is the fact that it has been used by many companies other than the one which originated it.

Copy Supplied by Manufacturers Useful.

Manufacturers' advertisements are, on the whole, excellent, and it is to be regretted that they are not even more generally used. The copy is written by men skilled in that line, the arrangement is attractive and the illustrations are of such a character that they could be duplicated only by the largest companies. In spite of some arguments against these stock advertisements, it is very generally agreed that arguments which gain customers in New York state will get business as well in Oklahoma. Human nature is very much the same, and people in the same walks of life want the same things for the same reasons.

For the companies making use of the manufacturers' advertising service the problem reduces itself merely to selecting those advertisements which most nearly fit conditions. These can be alternated with advertisements of a purely local nature. In a monthly sample sheet published by the General Electric Company, not only sample advertisements are reproduced, but valuable advice is given. Brief directions are included as to the steps necessary to push most effectively the particular article or appliance covered.

The company that uses these prepared advertisements not only saves a good deal of time, but the man responsible for its publicity has also at his command the product of experienced copy writers. He thus obtains at once and with very little trouble the result which he himself could produce only after considerable experience.

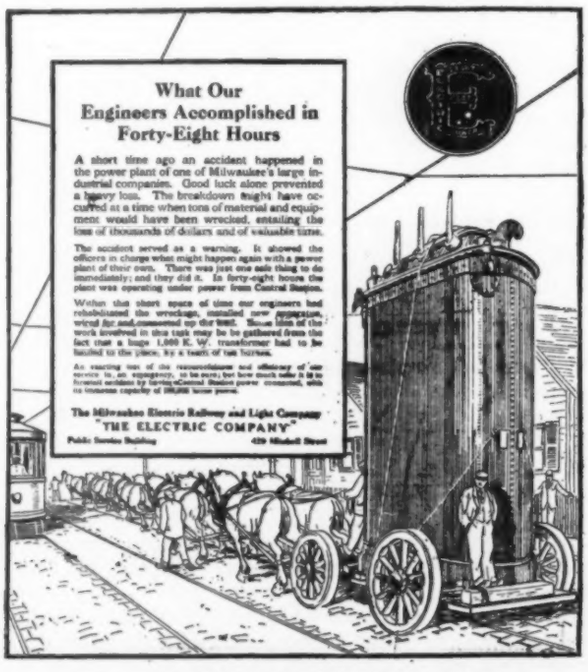

What Our
Engineers Accomplished in
Forty-Eight Hours
A short time ago an accident happened in the power plant of one of Milwaukee's large industrial companies. Good luck alone prevented a heavy loss. The breakdown might have occurred at a time when tons of material and equipment would have been wrecked, entailing the loss of thousands of dollars and of valuable time.
The accident served as a warning. It showed the officers in charge what might happen again with a power plant of their own. There was just one safe thing to do immediately; and they did it. In forty-eight hours the plant was operating under power from Central Station.
The Milwaukee Electric Railway and Light Company
"THE ELECTRIC COMPANY"

Fig. 1.—An Advertisement With News Value.

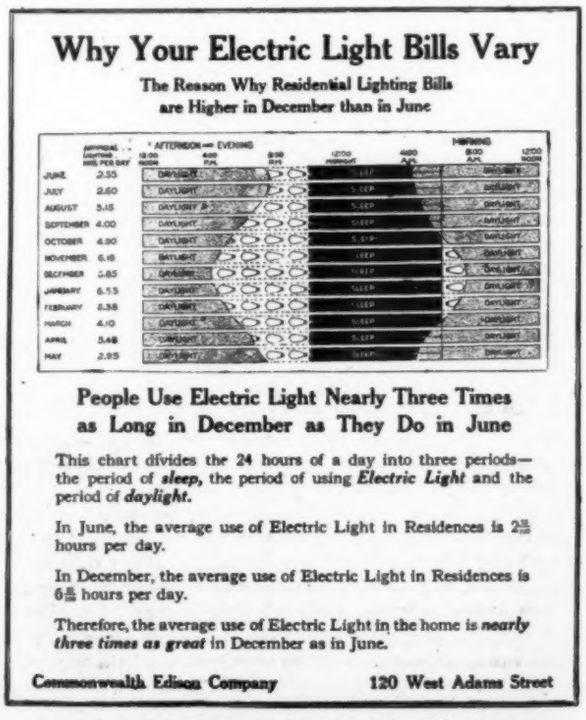

Why Your Electric Light Bills Vary
The Reason Why Residential Lighting Bills are Higher in December than in June
People Use Electric Light Nearly Three Times as Long in December as They Do in June
This chart divides the 24 hours of a day into three periods—the period of sleep, the period of using Electric Light and the period of daylight.
In June, the average use of Electric Light in Residences is 2 55/100 hours per day.
In December, the average use of Electric Light in Residences is 6 55/100 hours per day.
Therefore, the average use of Electric Light in the home is nearly three times as great in December as in June.
Commonwealth Edison Company
120 West Adams Street

Fig. 2.—Advertisement Showing Why Bills Vary.

Physical Appearance of Copy Important.

To the man who writes his own advertising—if he lacks experience in printing—it is a source of constant wonder that his apparently plain directions can be misunderstood in so many different ways. Often the copy set up bears so little resemblance to the mental image the writer had, as to be hardly recognizable. The remedy is simple. It lies in giving the printer a definite layout. By this countless difficulties and disappointments may be avoided. Plan the advertisement as you would a drawing. Don't forget that white space is often as valuable as type matter. Make the directions as specific as you know how.

The point of proper white space is illustrated by the advertisement and revised arrangement, Figs. 3 and 4. The copy used in that space is good. The prices quoted ought to attract trade. In many ways it is a good advertisement, but it would have been a better one if a little more white space, and some such an arrangement as the revised one had been used.

It is an advantage if all the advertisements used by any concern have the same general appearance. This does not mean that the series should be monotonous. On the contrary, each piece of copy should possess enough points of interest to insure at least a hurried reading from all who see it. The similarity of style will attract attention rather than the reverse, if the copy is, as a general rule, interesting. The advertisement that is immediately recognized as being one of an interesting series is most apt to be read through.

Whether such things attract attention or not, there is nothing more harmful to any advertisement than an unpleasant reference or disagreeable comparison. While it may seem foreign to the subject of central-station advertising, here is a valuable example offered by a series of advertisements on beer run several months ago. This series featured a disagreeable taste in connection with other manufacturers' product. The bad feature was that the idea of an unpleasant taste associated itself with the product advertised and the firm using this copy harmed itself more than it did its competitors. The average central station is in a good deal the same position as that brewer. In no case should unpleasant associations be suggested by the advertising matter. Sometimes the temptations to refer to the expensive, dangerous, unhealthful gas light is strong, but it should be remembered that this light also has its merits. Electric light and electric power have enough advantages of their own to warrant a very general use without calling the attention of the public to the deficiencies of any other system of lighting or power. The best advertising is constructive. The same thing might apply to the exploitation of the Mazda lamp as against the older carbon incandescent. It leaves a great deal better impression if the great merits of the tungsten are exploited rather than the deficiencies of the carbon lamp.

Use Care in Selecting Illustrations.

So-called humorous illustrations—especially the cheaper sort—are without excuse in any advertising and they are particularly objectionable in any copy relating to a public service company. In some cases there may be more or less reason for using pictures of this kind, but stock illustrations of the variety so common a few years ago are without any justifying merit. The man who is tricked into reading an advertisement by an irrevelant headline or an illustration which would apply as well to a clothing store as it does to a central station loses confidence in the good intentions of the advertiser at the very start. The advertisement, Fig. 5, showing a colored gentleman apparently holding an electric motor out on a tray would certainly not have any influence in converting a manufacturer to the use of electric drive, or even in interesting him in the advantages of electric power. This advertisement is taken from a series—not all humorous—prepared by a western company unusually aggressive in the matter of newspaper advertising.

The question of how much copy to use is as difficult to answer as would be the question of what to run.

ELECTRIC
COFFEE
PERCOLATORS
Special Sale Day
Monday, Oct. 21st
Special Sale price, 5-cup, $5.50. Regular price, $7.50
Special Sale price, 7-cup, $5.85. Regular price, $8.00
Special Sale price, 9-cup, $6.25. Regular price, $8.00
¶ The Electric Coffee Percolator brews coffee by percolating
¶ Simple in construction—durable—provided with cord and plug which can be attached to any electric light socket.
¶ Percolation starts in less than a minute—you can see it work and have sparkling aromatic hot coffee, weak or strong, just as you like it, in a few minutes.
¶ The cost for electricity is a trifle.
¶ You'll never know how good it is, and the convenience of an "Electric Coffee Percolator," till you've used it.
SPECIAL SALE DAY, OCTOBER 21st
FOR SALE BY
Adam Electric Conveyor, Frank ... 906 Pine Street
Brokaw Electric Company ... 1117 Olive Street
Famous-Barr ... Sixth and Washington
Grand-Leader ... Sixth and Washington
Schaper Bros. ... Ninth and Washington
Scruggs-Vandervoort-Barney ... Tenth and Olive
Shiras Electric Company ... 921 Locust Street
St. Louis Brass Mfg. Co. ... Jefferson and Washington
Suburban Electric Light and Power Co. ... 709 Pine Street
Suburban Electric Light and Power Co. ... Webster Groves
Union Electric Light and Power Co. ... 12th and Locust
Union Electric Light and Power Co. ... 3012 S. Grand Avenue
Union Electric Light and Power Co. ... 4012 Delmar Avenue
UNION
ELECTRIC
LIGHT AND POWER
SERVICE

Fig. 3.—Bargain Advertisement, Copy Good, But Too Crowded.

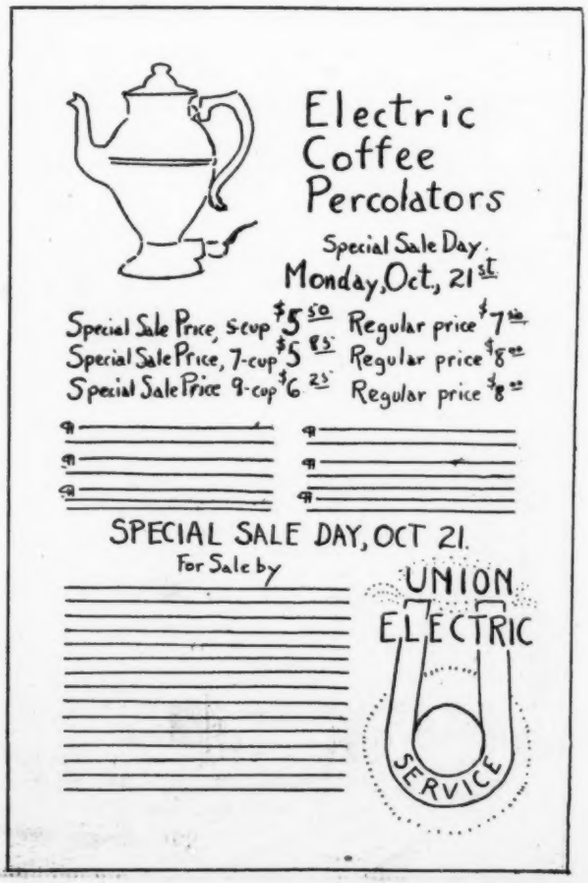


Fig. 4.—Suggested Layout for Same Advertisement.

One large advertiser likens the advertising appropriation to a pole needed for reaching a desired object. "If," says he, "an 11-foot pole is needed for the work, a 10-foot pole is exactly as good as none at all. The last foot is the necessary one." There is a great difference of opinion as to how much an advertiser should spend, and probably always will be. If the space used is accomplishing all the results that you feel are possible—if you have used greater space with no more replies there is surely no ground for increasing your expenditure. If

Let The
Electric
Motor
Help You
Do Your Work
AN electric motor is not expensive and it is a wonderfully convenient thing to have to operate machinery of any kind. Not only is the price of a motor low, but the operating cost is likewise low.
An electric motor is very durable and dependable. There is scarcely anything to wear out and a motor may be used for many years without having one cent's worth of repair work necessary. A motor is so quiet and clean, so small and convenient that it is just the thing in the small factory or shop
"Joaquin Service" means the best service at low cost.
San Joaquin Light & Power Co.
A. G. WISHON, General Manager.
E. B. WALTHALL, Assistant General Manager.
A. H. REES, Contract Agent.

Fig. 5.—Advertisement With a Meaningless Illustration.

it is found that an increase more than pays for itself, it is reasonable to believe that your space is well within the profitable limit.

It is almost universally agreed, however, that the advertising appropriation should be fixed and not subject to enlargement toward the end of the year. Whether it be one per cent of the total income or a half of one per cent it should be used consistently. The small advertisement, getting attention every day, taking the reader into confidence or offering inducements to become a user of electricity, is vastly better than an occasional large space. An advertisement need not be large to be conspicuous. The three-times-a-week advertisement taking up one argument after another, running the year round, and arranged to catch the eye, logically, not through freak pictures, is the one that will win, and bring returns on the money invested.

Power Rates in Kansas City to Be Reduced.

Revision of rates for power by the Kansas City Light & Power Company probably will occur shortly, the company having filed new schedules following its organization, as successor to the Kansas City Electric Light Company. All the power contracts were annulled by the reorganization and the entrance of the new company, according to the orders of Judge Hook. Some of the contracts annulled are said to have been at very low rates, and the abrogation of the contracts simplifies the establishment of new ones at, in the cases mentioned at least, a higher level. The domestic rates are not affected.

WHAT ENTHUSIASM CAN DO FOR A SIGN CAMPAIGN.

Toledo Company Sells Over 350 Electric Flag Signs in Three Months.

A few weeks ago George Williams, head of the new-business department of the Doherty companies, conceived the idea of the electric flag sign as a central-station opportunity. Today, thousands of these signs have been installed and sign manufacturers are finding the continual demand a tax on their manufacturing facilities, although by expending extra effort deliveries are being made without delay.

The Toledo (O.) Railways & Light Company was the first to grasp the importance of the Old Glory campaign and despite the fact that Toledo is, perhaps nearer the saturation point in electric signs than any other city in the country, up to date over 350 electric flag signs have been sold. Of course enthusiasm is largely responsible for this remarkable record. A. K. Young, new-business manager of the Toledo company, when the idea of the flag sign was suggested to him became enthusiastic over the idea and succeeded in installing this spirit in his department. Toledo merchants responded in a highly gratifying manner. It was of course to be expected that some of the prominent stores with patriotic managers would become interested, but the significant feature of the campaign was that the small establishments responded just as readily. Factories, warehouses, etc., ordinarily not considered live sign prospects also installed signs and in several instances electric flags were purchased for installations in interiors of shops, hotels, etc. The accompanying illustrations shows some of the noteworthy installations that have been made. In one view there is shown an automobile, decorated with an illuminated sign, that was used by salesmen in the campaign. Another view shows a flag sign in the shop of the Mather Spring Company.

Over 120 central stations are now pushing the electric flag sign and the aid of the National Lamp Works, of the General Electric Company, has been enlisted to further popularize the movement.

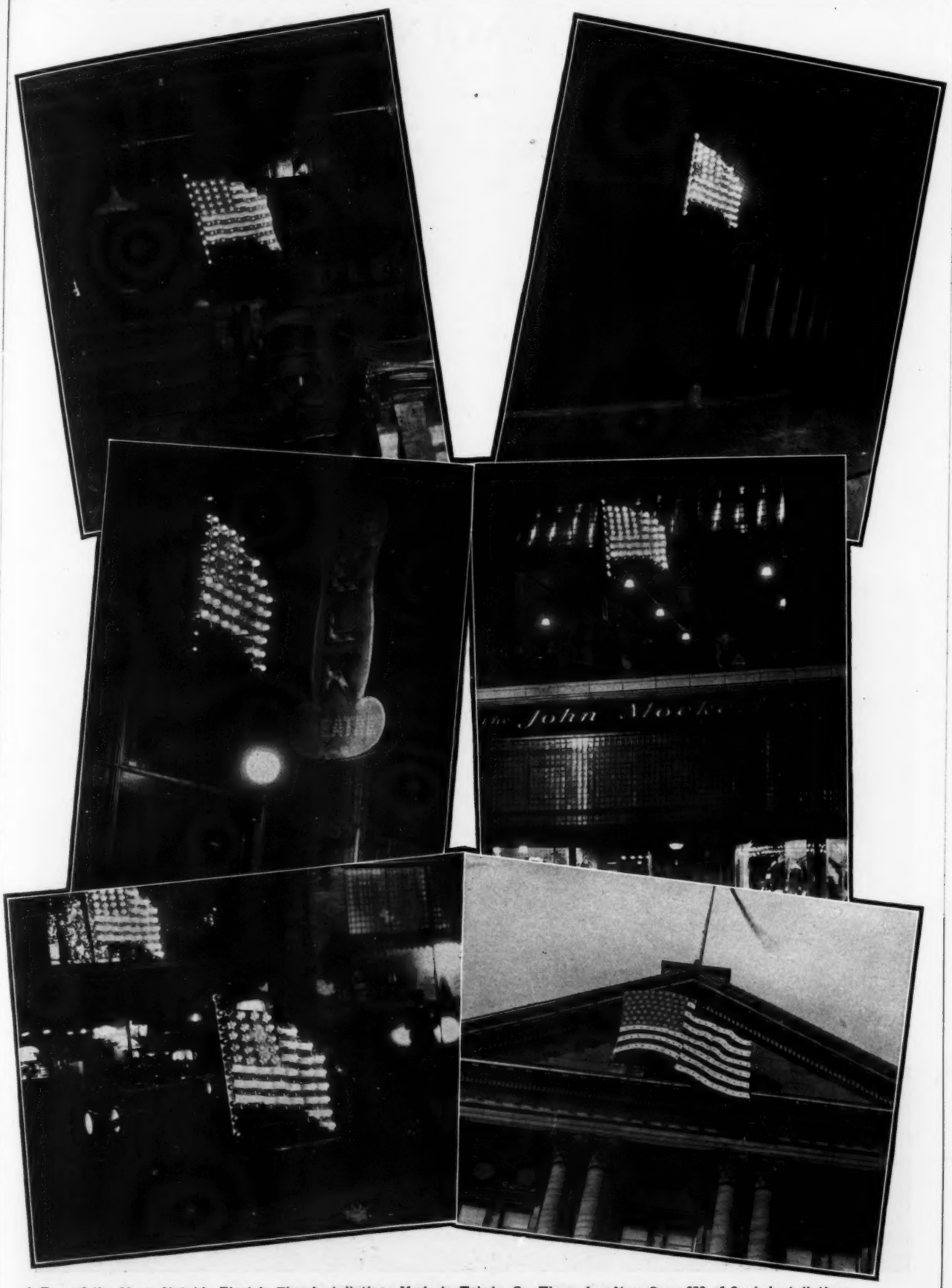
Large Power Contract for Pennsylvania Company.

The Penn Central Light & Power Company, of Altoona, Pa., has just signed up the largest power contract in the history of the corporation, it having secured the contract for furnishing electric power for the great Standard Steel Works at Burnham, near Lewistown, Pa. With the growth of the work at the Burnham plant, which is a part of the Baldwin Locomotive Works, the Standard company has decided to purchase electric power, instead of using its own electric power, as before. In preparation, it has spent large sums of money installing substations and transformers and has now contracted with the Penn Central company for a load of 4,100 horsepower.

Residence Section of Oklahoma City to Have "White Way" Lighting.

Contract has been secured by the sales department of the Oklahoma Gas & Electric Company for a "White Way" system in "Harndale," a residence addition of Oklahoma City covering about 40 acres. The first part of the installation, consisting of 22 cast-iron standards painted white, will be installed immediately. Each standard will be surmounted by an acorn-shaped globe containing one 250-watt lamp. This installation is believed to be the forerunner of a number which will be placed in other residence sections of the city.

Patriotism in Toledo.



A Few of the Many Notable Electric Flag Installations Made in Toledo, O. There Are Now Over 350 of Such Installations.

POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

ELECTRICITY IN THE MANUFACTURE OF PAINT AND VARNISH.

By Frank D. Burr.

The manufacture of mixed paint has been successfully carried on for the past 25 years by the McMurty Manufacturing Company, in Denver, Colo. It has been the object of the management to study and experiment, in order to obtain a formula which will produce a paint which wears as well in a dry climate as in a damp one. This is necessary in order to withstand the peculiar atmospheric conditions of the Rocky Mountain region.

The linseed oil, white lead and other pigments and color materials are taken to the third floor by means of a 4,000-pound Nock & Garside elevator, operated by a 10-horsepower, 220-volt, three-phase motor, running at 1,730 revolutions per minute. The materials are there mixed by means of a 35-horsepower, 220-volt, three-phase motor, running at 1,200 revolutions per minute, driving a group of 13 Ross mixers having a capacity of 35 gallons each, and four pony mixers of 10-gallon capacity. These machines, shown in one of the accompanying views, consist of vertical cylinders, in the center of which is a vertical shaft, on which are mixing blades rotating within the cylinder to thoroughly mix to a paste the materials, and beveled geared to the line shaft, which is belted to the motor. After a mixing has been completed the material is taken to the second floor by means of chutes, where it is finely ground by three groups of burr mills. A 20-horsepower, 220-volt, three-phase motor, running at 1,200 revolutions per minute, drives three 26-inch Ross burr mills, and three 30-inch Ross burr mills and four 20-inch Kent burr mills. A 20-horsepower, 220-volt, three-phase motor, running at 1,200 revolutions per minute, drives two 30-inch Ross burr mills, two 26-inch and one 26-inch Kent burr mills and two 18-inch Ross iron mills and grindstone for sharpening the chisels, for cutting the grooves in the burr mill. A 10-horsepower, 220-volt, three-phase motor, running at 1,200 revolutions per minute, drives three 20-inch Kent burr mills and four 20-inch Ross burr mills. These burr mills consist of a round carborundum burr or stone, which has sharp-edged grooves radiating from the center, and each is driven by a

Group of Paint Mixers Driven by 35-Horsepower Motor.

Group of Agitators Driven by 7.5-Horsepower Motor.

Group of Burr Mills Driven by 20-Horsepower Motor.

vertical shaft beveled-geared to a line shaft belted to the motor.

After being properly ground the material is then sent to the first floor by means of chutes, where it is deposited into the agitator and thinned with linseed oil and blended to obtain the various necessary colors.

These machines consist of two groups, one driven by a 7.5-horsepower, 230-volt, three-phase motor, running at 1,200-revolutions per minute, driving eight 135-gallon agitators and three 500-gallon agitators. The 7.5-horsepower motor drives six 135-gallon agitators and three 500-gallon agitators. These machines consist of vertical cylindrical tanks, in the center of which revolves a shaft with blades connected for stirring the mixture, and connected by beveled gear, to the line shaft, which is belted to the motor.

A 10-horsepower, 220-volt, three-phase motor, running at 1,200 revolutions per minute, on the first floor, drives a putty chaser, which mixes together whiting (calcium carbonate) and linseed oil for one-half hour, in order to produce 400 pounds of putty. The putty chaser consists of a six-foot pan, in which the material is placed. A vertical shaft rotates in the center, clamped to which, at right angles, is an axle on each end of which is rotated a cast-iron roller five inches in diameter, which rolls and grinds the whiting and oil together. A plow share is also attached to the vertical shaft, which scrapes the flattened material from the bottom of the pan, standing it on edge, to be mixed and ground.

The varnish is made by depositing gum and rosin into a large two-wheel kettle, which is conveyed over a coke fire or a gas burner, and is there cooked until it reaches the proper consistency. It is then poured from the kettles into tanks. After being cooled it is pumped to the thinning tanks, where it is mixed with linseed oil, which has been further treated in the factory, so as to obtain the best effect for the uses intended.

For this purpose two one-horsepower motors, driving two 0.5-inch Deming rotating pumps, are used. The linseed oil is pumped by means of a two-horsepower motor, driving a Deming rotating pump and a one-horsepower Deming rotating pump.

The varnish is then in some cases thinned with benzine and filtered by means of a three-horsepower, 220-volt, three-phase motor, running at 1,800 revolutions per minute, driving two filter presses. These consist of a centrifugal machine, operating upon the principle of a cream separator, which runs at a speed of 6,000 revolutions per minute. The same motor drives a Gould rotary pump, which forces the liquid to the tanks which feed the filter presses.

The varnish is then kept in vessels and aged. The best varnish requires an age of four years. Energy is supplied by the Denver Gas & Electric Light Company.

Economy Effected by Individual Motor Drive in Machine Shops.

One of the most specialized applications of individual motor drive is exemplified in the installation of the Washington Iron Works, at Sherman, Texas. This shop was established in 1876 and has done a prosperous business ever since.

Although there are a total of 31 motors installed, the average kilowatt-hour consumption varies from 331 to 642 per month. Every machine has an individual motor and when a machine is not in use, no power is being consumed.

The consumption per month by years is as follows:

Year	Total Kilowatt-hours	Average per Month
1913	5,970	497
1914	7,700	642
1915	3,979	331

The monthly consumption during 1914, the banner year of the company, was as shown in the following table:

Month	Kilowatt-hours	Month	Kilowatt-hours
January	750	September	540
February	690	October	670
March	530	November	930
April	550	December	1,030
May	450		
June	600		
July	360		
August	600		

Following are the machines installed with the motors which drive them:

WASHINGTON IRON WORKS, SHERMAN, TEX.

Direct-Connected Motors in Service, March 1, 1916.

No.	Horsepower	Driving
1	10	30-inch Leblond engine lathe.
1	7.5	24-inch Leblond engine lathe.
1	1.5	16-inch L. & S. engine lathe.
1	0.5	11-inch Star Precision engine lathe.
1	3	Shaper.
1	2	Emery wheel.
1	1	Emery wheel.
1	0.25	Emery wheel.
1	0.25	Portable emery grinder.
1	0.25	Portable breast drill.
1	1	Hydraulic press.
1	5	W. S. lathe.
1	0.5	15-inch hack saw.
1	0.25	6-inch hack saw.
1	1	Sensitive drill.
1	5	Drill spindle—radial 5-foot.
1	3	Elevating arm—radial.
1	0.5	Operating large panel street door (open and close).
1	5	Hoist, 5-ton traveling crane.
1	0.5	Carriage of 5-ton traveling crane.
1	0.5	Bridge of 5-ton traveling crane.
1	2	Blacksmith forge with exhaust fan attached.
1	15	Old belted tools.
1	2	Foundry pressure blower.
1	5	Casting cleaner.
1	2	Rip saw.
1	0.5	Jig saw.
1	1	20-inch woodworking lathe.
1	3	Portable lathe for job work.
1	2	Portable extension for job work.
1	0.5	Gas blower.

All motors 220-volt direct current.

ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

INSTALLATION OF KNOB-AND-TUBE WIRING.

By Terrell Croft.

Knob-and-tube wiring was formerly used in practically all frame buildings and still finds wide application. Its installation is, however, now prohibited in certain cities, Chicago and Denver, for instance, where by municipal ordinance conduit or armored-cable wiring only is permitted for concealed work. Knob-and-tube wiring is the cheapest of all of the methods of concealed wiring and can, obviously, be used only in frame buildings and in brick structures with lath and plaster partitions.

Disadvantageous Features.

The disadvantageous features of knob-and-tube wiring are:

(1) The conductors are unprotected from mechanical injury.

(2) A fire originating in rubber insulation on one of the conductors will readily follow along that conductor and may ignite adjacent timbers.

(3) Even if, when the installation is made, all of the conductors are thoroughly insulated in accordance with prescribed practice, there is no assurance that they will remain so. The warping and shrinkage of timbers, the settling of the building and the breakage of the brittle porcelain knobs and tubes, may permit the conductors to make contact with damp wood or grounded pipes.

(4) The porcelain-tube bushings used for protecting the conductors through joists may, and often do, back out of the timbers and permit the conductor to make contact with them.

(5) Grounded metalwork, such as pipes, steel beams and girders, are liable to be placed in contact with the conductors after they are installed but before the building is finished. Sometimes these interfering members may be placed after the building is finished.

(6) Building tradesmen, other than wiremen, may, after

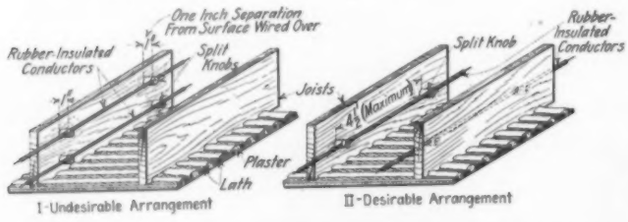


Fig. 1.—Showing How Conductors Should Be Run on Separate Timbers.

the wireman has left the job and prior to plastering, place members in contact with the conductors.

Insulation and Separation.

Knob-and-tube-wiring conductors should have rubber insulation. It is apparent from a consideration of the above outlined disadvantageous features of the method that only the very best insulation should be used, because of the possibility of the conductors touching wood or metal work. Rubber is the best insulation for conductors that is now commercially available.

Knobs giving a one-inch separation from the surface should be used in knob-and-tube work (Fig. 1). Porcelain cleats do not ordinarily provide this separation, hence they should not be applied.

The conductors should always be run on separate tim-

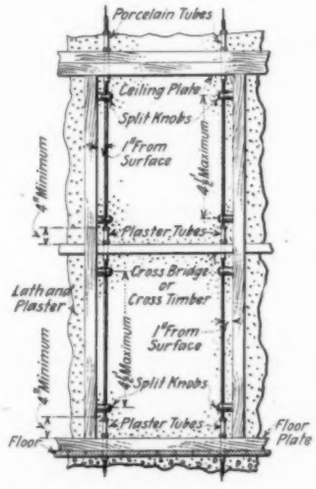


Fig. 2.—Showing Application of "Plaster or Mud Tubes."

bers where possible, as shown in Figs. 1, 2 and 3 *I*, to reduce the liability of their touching one another. Even where the five-inch separation, which is prescribed for knob-and-tube work, can be maintained between the conductors, it is better to support them on separate timbers where feasible. This is in accordance with the suggestion in Rule 26*r* of the National Electrical Code.

Tubes and Protective Bushings.

Where the conductors pass through timbers, the holes must be bushed with porcelain tubes, as shown in Fig. 2. Joists should be similarly bushed. A damp timber may be a reasonably good conductor, hence this provision.

Where the conductors pass through horizontal timbers, an additional porcelain tube, known as a "plaster tube," should be used on top of the bushing tube. These tubes are sometimes also called "mud tubes." Their function is to prevent the plaster droppings from coming in contact with the conductor. Dry plaster is a fairly good insulator, but wet plaster is a good conductor and, furthermore, may have an injurious chemical effect on the wire and its insulation. See Rule 26*r*, paragraph 2.

The minimum permissible distance between supports is 4 feet 6 inches, as indicated in Fig. 2. That is, a knob should be placed at least every 4 feet 6 inches along every conductor, unless tubes, which in themselves constitute supports, are interposed between. Frequently, particularly in unfinished basements and in other places where the wires are liable to mechanical interferences, it is well to

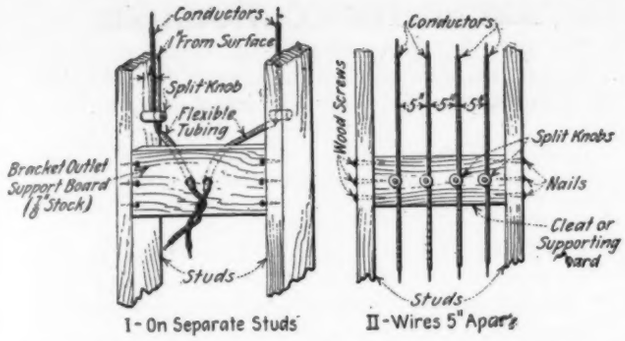


Fig. 3.—Proper Arrangement of Conductors in Knob-and-Tube Installation.

locate the knobs 2 feet 6 inches or 3 feet apart. (See Rule 26*r*, paragraph 3.)

Flexible Protective Tubing.

Where the wires cannot be separated from each other by at least 5 inches, flexible tubing should be slipped over the conductors for additional protection, as shown in Figs. 4 and 5. The tubing should always extend from the last

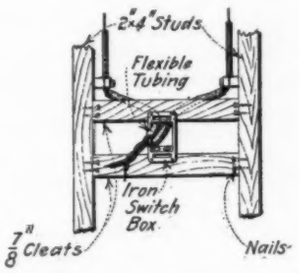


Fig. 5.—Flexible Tubing-Encased Conductors Entering a Metal Outlet Box.

porcelain support to and through the outlet. The conductors should, prior to the completion of the job, be twisted together outside of the outlet, as suggested in the illustrations, to prevent the tubing from slipping off. At a combination fixture outlet, the pieces of tubing may be bound to the gas pipe with an iron or copper tie wire, as

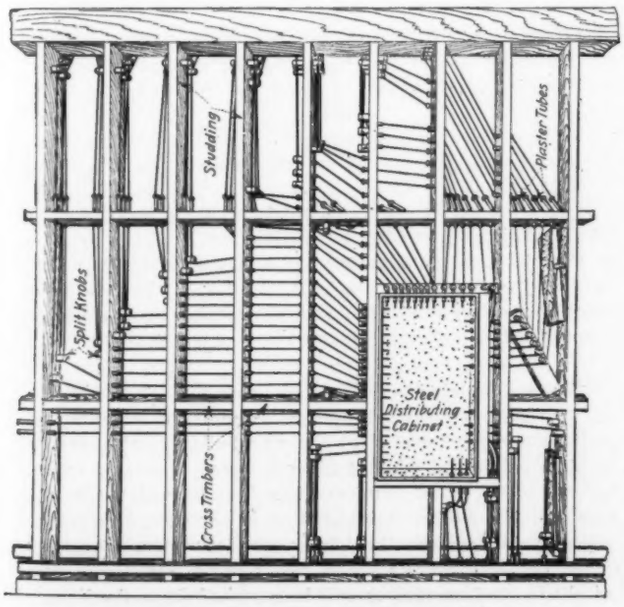


Fig. 6.—An Example of Good Knob-and-Tube Work.

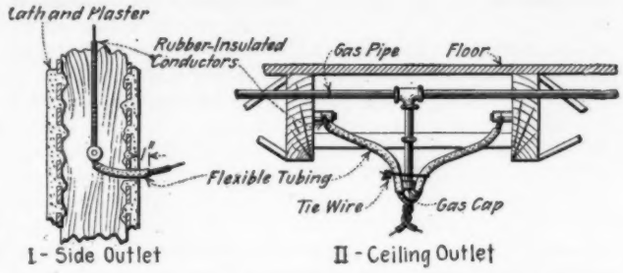


Fig. 4.—Arrangement of Conductors at Side and Ceiling Outlets.

shown in Fig. 4 *II* to hold them close together to insure that the fixture canopy, after it is installed, will cover the wire ends. The tie wire also prevents the tubing from slipping down. In applying the tie wire care should be taken not to draw it so tight as to cut the tubing.

Use plenty of knobs and tubes and flexible tubing to prevent the possibility of any non-insulated member contacting with the conductors. Where there is any doubt as to the possibility of a future accidental contact, place another knob and tube or use more flexible tubing, as the case may require. Fig. 6 shows an example of a good knob-and-tube installation. In such a large installation it is manifestly impossible to run wires singly on separate timbers or studding; therefore extra care should be observed.

Installation On or In Brick Walls.

Where conductors must be installed on or in brick or masonry walls, steel conduit is used as shown in Fig. 7. Such walls, particularly outside walls, may be "damp places." They are so considered, hence flexible-tubing-incased conductors should not be imbedded in them nor should they be placed where they will be imbedded in plaster. The illustration shows how the conduit is applied in combination with knob-and-tube wiring. A conduit run must always terminate in an accessible outlet box or fitting, hence an accessible outlet box must be located where knob-and-tube wiring joins conduit wiring. Usually the outlet box where the junction is made is located at a fixture or bracket outlet as shown in Fig. 7, so that the fixture canopy covers it after the installation has been completed. Either rigid conduit or flexible conduit may be installed in the brick walls, masonry or plaster. The installation must be complete (and in the case of flexible conduit the walls should be dry) before the wire is pulled into the duct. If flexible conduit is used, that of the ordinary type is usually

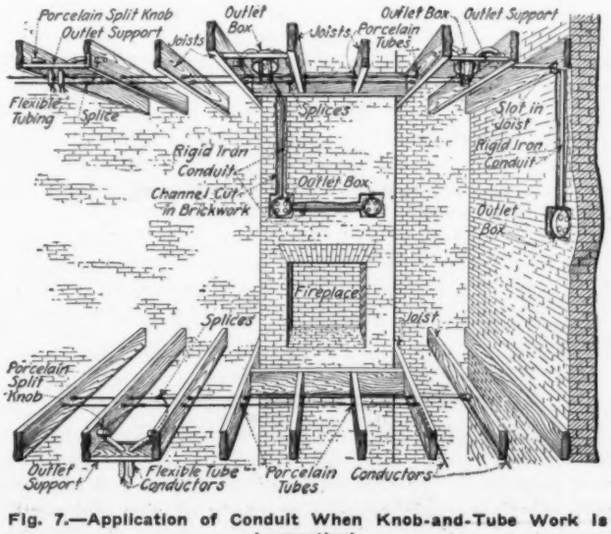


Fig. 7.—Application of Conduit When Knob-and-Tube Work Is Impractical.

accepted by wiring inspectors, but if the walls or location will always be damp, flexible steel-armored, lead-covered cable (BXL) or flexible conduit otherwise manufactured in such a way as to be watertight is ordinarily required.

When installing short conduit runs in combination with a knob-and-tube system the essential rules covering the installation of conduit should be followed, that is, the conduit should be continuous from outlet to outlet and fitted at all outlets with suitable steel outlet boxes, bushings and locknuts. The other rules relating to conduit installations also apply, in general, with the exception that it is not usually considered necessary to ground the short conduit runs.

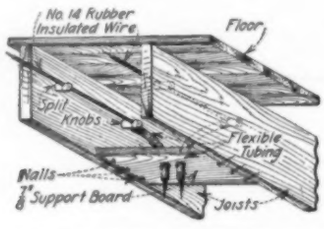


Fig. 8.—Straight-Electric Ceiling Outlet—Knob-and-Tube Work.

The conduits in these cases are frequently considered as coming under the head of protective runs, and, are, therefore, subject to the specification of Rule 26*e*, paragraph 3, wherein it is specified that conduit used for sidewall protection need not be grounded. Some inspectors do not require the grounding of a protective conduit run, unless the run is of excessive length. Ordinarily it is considered unnecessary to ground a run unless it has a length greater than 10 or 12 feet.

Protection at Outlets.

Conductors should be incased in flexible tubing at all outlets, as shown in Fig. 8, and in certain of the preceding illustrations. This is, in a sense, merely a repetition of the requirement (previously cited) that all conductors should be incased in tubing if the distance between them is less than five inches. The tubing should extend past the gas cap on combination gas and electric fixture outlets, to prevent the conductor contacting with the gas pipe that will ultimately be placed at the outlet. It should also extend at least one inch beyond the wall or ceiling surface, as shown in Fig. 3 *I*. Only continuous lengths of tubing should be used for wire protection at these outlets. It is inadvisable and poor practice to slip several short lengths of tubing over the conductor, because they are liable to separate, leaving the conductor unprotected.

Every wire should be fastened by a knob at every outlet. It is not sufficient for it to merely pass through a tube near an outlet. This is particularly true in the case of outlets at the ends of long runs. Unless the knob is so located as to hold the wire at the end of the run the wire is liable to sag back and touch wood or metal. Fig. 6 illustrates this point, knobs having been placed near the distributing cabinet at the end of each run.

Holes around outlets should be closed with plaster, because a draft may draw a flame from burning conductors or some other source into the partition space. This requirement is of particular importance in wiring finished frame buildings.

Copperless Machinery in Germany.

Electrical firms in Germany have been constructing transformers having zinc windings for some time past, and are now engaged in the production of generators and motors with windings made entirely or partly of zinc and commutators of steel.

AMONG THE CONTRACTORS.

The Reynolds Electrical Supply Company, Santa Barbara, Cal., has been awarded the contract for the installation of ornamental lights in the Riviera district.

B. H. Tingley has opened an electrical-supply store in Johnson City, N. Y., and will do electrical contracting. He would like to receive manufacturers' catalogs and circulars.

The Tri-City Electric Company of Davenport, Iowa, has renewed its articles of incorporation for another 20 years. W. T. Ball is president and W. J. Ball is secretary of the company.

A. R. Collins, of Detroit, and H. W. Lobdell, of Grand Rapids, have formed the Electrical Service Company of Muskegon, Mich., and will do electrical contracting and handle supplies.

The Thomas Electric Company, Marion, Ind., Fred H. Thomas, manager, has moved from 114 West Fourth Street to 224 West Third Street, that city. The company is doing a good business in fixtures and supplies and electrical contracting.

The contracts for the electrical work in the new interurban building at Dallas, Tex., have been awarded to the G. D. Cammack Company, of Dallas. The contract will include electrical conduit, lighting, fans, fire-alarm system, wiring for elevators and all minor electrical equipment.

The Bailey Electric Company, Bloomington, Ill., has the contract for the electrical work for the new high school at Bloomington and is progressing nicely with the work. The school is of fireproof construction throughout and the electrical work will be in conduit. The Bailey company will furnish practically all of the fixtures. The contract price for the electrical work is in the neighborhood of $10,000, and the total cost of the building will be about $500,000.

The United Electrical Construction Company, Chicago, Ill., has commenced work on the electrical equipment of the Chicago & Northwestern Railroad office and record building now being erected at Lawrence and Ravenswood Avenues, Chicago. The contract calls for the installation of 210 circuits, 250 horsepower in motors, 1,700 lights and 3,175 outlets, 723 of which will be for dictaphones. Two carloads of conduit will be used for the electrical work.

William H. Knapp, who recently sold his interest in the Jamestown Electric Company has formed a new company to be known as the Knapp Electric Company, and will open a store on Main Street, Jamestown, N. Y., in the Odd Fellows Building about May 1. Mr. Knapp has been engaged in the electrical contracting and supplies furnishing business in Jamestown for the past 13 years. The new company will do general electrical contracting and will make a specialty of lighting equipment.

United Electrical Construction Company, Philadelphia, Pa., has been awarded the electrical contract, including the engines and generators, for the new building to be erected at Nineteenth and Walnut Streets, here. The cost will be $50,000. The same company has been awarded the contract for the electrical installation in the new building being erected here for the Victor Box Manufacturing Company, Quakertown, Pa. The cost will be $10,000. A total of about 500 horsepower will be supplied from the lines of the Lehigh Valley Light & Power Company.

DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Forcing String Through Conduit by Means of Compressed Air.

In drawing wire through conduit installed in large factories where compressed air is available, considerable saving of time can be effected in the following manner. Take a ball of mason cord and start the end of the string in the pipe, blowing with the compressed air; the ball will unwind and blow the string right through. I have never had this fail in any length of pipe I have had to deal with.

W. D. Wilson.

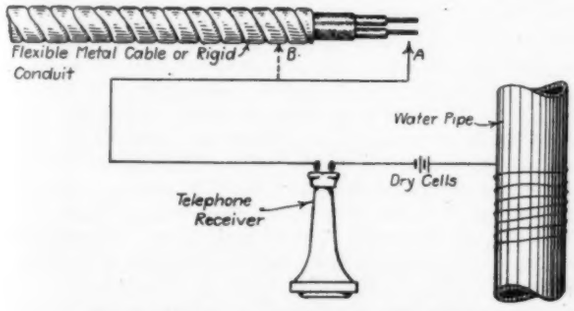
Fishing by Suction.

An easy way to fish wires through a long run of pipe, where you cannot push a steel snake wire through, is to get an ordinary vacuum cleaner, either electric or hand-operated, and put the rubber hose into one end of the pipe. Next take a spool of stiff thread and tie a small ball of cotton wad to it and push this into the other end of the pipe. By starting the vacuum cleaner you will be able to suck the ball right through the pipe, dragging the thread after it. Next tie a piece of string to the end of the thread and pull this through and tie your wires to it. By doing this you will find that you can overcome trouble in a great many places.

Walter Morris.

Ground Test on Conduit or Armored-Cable Installations.

This is a simple and accurate test for grounds on flexible or rigid metal conduit, metal molding or armored cable installations. Each wire is tested out as per terminal *A* in the diagram. If the wire is grounded a clicking sound will be heard in the receiver each time that the test wire is brushed across the grounded cable wire. If the wires are



Ground Test for Armored-Cable Installation.

clear there will be no sound from the receiver when the wires touch each other. To test whether the conduit itself or the metal sheath is properly grounded, apply the test wire, as shown dotted at *B*. In the same way a click in the receiver indicates a grounded condition; the absence of the click indicates absence of a ground, and, therefore, the need for proper grounding of the sheath or conduit.

M. J. Moriarty.

Test of Motor-Field Polarity with a Carbon Lamp.

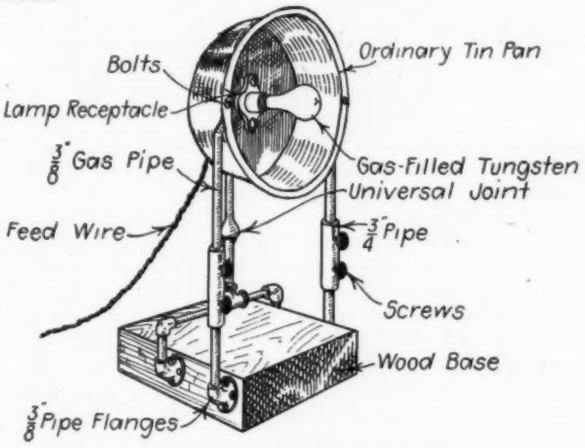
It is very often necessary to test the polarity in the field coils of a motor, to see that adjoining ones do not buck. A very simple way of doing this, other than by using a compass, is as follows:

Pass a current through the fields and then take an ordinary carbon incandescent lamp, preferably one with an unanchored single-loop filament, and bring it near one field at a time, as though testing with a compass. The filament will have a tendency to deflect in opposite directions as the different coils are tested. If the filament does not deflect in opposite directions as the adjoining coils are tested, then one or more of the field coils are reversed.

Charles Stadmuller.

Home-Made Flood-Light Projector for Construction Work.

On a rush installation of electrical work in a theater several home-made flood-light projectors similar to that shown in the accompanying sketch were used, since projectors especially made for the purpose and now on the market could not be obtained in time. The reflecting surface consisted of an ordinary tin pan, which cost only a small amount in a hardware store. The pan was large enough to permit using a 500-candlepower nitrogen-filled lamp. The lamp receptacle was mounted in the center of the pan, as shown.



Home-Made Flood-Light Projector.

The tin pan was supported by means of three-eighth-inch gas pipe in such a way as to permit adjustment of the projectors up and down through various angles. The two pipes in the front of the projector were arranged with a sleeve with two wing screws, which permitted these pipes to be shortened or lengthened for adjustment. The rear pipe was arranged with a universal joint, which acted as a hinge. By using a loose tee at the bottom of the rear pipe, the universal joint probably could be dispensed with, or the lower part of this rear pipe below the universal joint could have been mounted in a flange directly on top of the wood block to which the pipes were secured. For temporary and emergency lighting purposes these projectors gave fairly satisfactory results. For regular use in construction work the commercial forms of projectors will, of course, give much better efficiency.

M. J. Moriarty.

Fishing Through Hollow Cement Blocks.

When fishing through hollow cement blocks for a switch line or side light, it is often difficult to get down through the blocks since the openings in the blocks are not always above one another. A fishing line with a chain or weight on the end of it, when it hits the partition in the blocks cannot be swung from side to side after it has passed several lapping openings. A small rubber ball, large enough so that its diameter is the same as that of two pieces of loom, with a screw or nail driven in it and the fish line tied to this, can be bounced by jerking the fish line and it will fall through a very long row of irregular openings.

Carl V. Hench.

CORRESPONDENCE AND DISCUSSION

A Reader's Page Wherein Opinions on Topics of General Interest May Be Expressed

Grounding of Secondaries.

To the Editor:

I have read with great interest Mr. C. H. Hill's letter in the issue of January 15, and the replies thereto in the issue of February 19, and I trust you will find room for these few remarks thereon.

Mr. Croft gave originally four disadvantages of grounding in his paper of January 1, as follows:

(1) A single ground on a grounded system may and probably will interfere with the service.

Quite true, but this is vastly preferable to allowing that ground to set a hidden trap which an unsuspecting consumer will later on unwittingly spring to his own or another's injury.

(2) That it puts full potential between the ungrounded wire and the ground.

Well, it is only required up to a possibility of 150 volts between these two points, and if there is on the market today any wire which will stand safely 75 volts between core and outer surface of braid, but has no factor of safety when that potential difference becomes 150 volts, it is mere junk and it ought to be a criminal offense to make, sell or install it for such work.

(3) Possible difficulty in testing.

This is rather remote and technical. I have not been stumped yet though it might sometimes be necessary to remove the ground connection temporarily, not a difficult thing to do usually.

(4) Increase of expense.

I can not say as to this point as in this neighborhood I have only the statement of the contractors I have inquired of that they wouldn't change their figures merely for leaving off the ground connection except in very rare cases. It wouldn't hit my own town anyway.

Now, as to the fire risk. I have been interested as inspector in Concord for 9 years, since inspection was first begun. I have the town reports for the last eight of those years before me and during those eight years we have had a total fire loss of $117,656. In these eight recorded years (I ordered grounding when I took office and no fires occurred the first year from electricity), we have had one electric fire, due to misuse of a flat iron, with attendant loss of $138. One fire with a loss of $17,000 was at first attributed to "electric wires" but afterward by admission it was shown to be due to hot ashes and similar stuff placed in a wooden receptacle. During this same period lightning set four fires with a total loss of $12,410 in unwired buildings, none in wired buildings.

Thus the total loss attributable to electric installations is 0.012 per cent, considerably below 0.5 per cent and none of it at all traceable to grounding. Our present assumed valuation is $9,318,000 and the population about 7,000.

During all this time our three-wire secondary network has been grounded every 250 feet and every installation fed by an isolated transformer individually grounded. Our grounds are made this way because of certain existing amounts of cement pipe, but the grounds are grounds for the town lies low along a slow flowing river, and permanent moisture is reached anywhere at depths from 10 to 15 feet in a sandy gravel overlaying the hard-pan bottom of the ancient glacial lake. When water or sewer lines are being laid it is not at all easy to keep the trenches dry.

As to transformer insulation, I believe our high grade of today is largely due to manufacturers meeting the conditions of stress due to grounding, and the low percentage of breakdowns to be primarily due to the quality of insulation incident to insisting on grounding; as those of us who remember conditions when grounding was originally broached will recall.

It is pure bosh to attempt any argument based on the money value of human life, per cent of persons killed due to non-grounded secondary in an installation in town with municipal inspection, at least under our laws. If a suit for damages is brought based on a discoverable fault in an approved installation where the inspector has full legal power behind him, and the inspector puts up the argument that he did not compel the grounding because, though he knew it undoubtedly decreased the life hazard, it slightly increased the fire hazard, that municipality will lose the case, for counsel will have no difficulty in proving negligence and the inspector ought to lose his job.

As Mr. Wynkoop says, when you find one bridged wire you most commonly find two, and in my experience trouble due to grounding is the cause of an almost infinitesimal amount of "bridging." It is usually caused by barefaced, deliberate overloading of circuits, wilfully or ignorantly, and if I can trace it to a licensed wireman, under our present law, I shall do my best to have him deprived of his license.

As to the layman, just one thing will cure it—education, and as the use of electricity increases, we must either trust to slow bitter experience with its attendant loss, to high-cost inquisitorial inspection as in some European countries where it reaches the domestic details of life, or somebody has got to do the educating.

I have, in the past two years, given two talks to the high-school pupils, one to a large private school, one to the grammar grades, two to men's and women's clubs and when the two local boy-scout patrols meet with my boys at our house, I frequently talk electricity with them.

In my report to the town, I make it a custom to insert about four pages written as interestingly as I can on domestic uses of electricity, risk of tampering with the wires, overloading, overfusing, etc., and I can positively say that "bridging" is among the least of my worries today with trouble from grounding a close second.

We can all improve what chance we get in the education line, not as the official with the law behind him, or the sometimes unwelcome inspector for the insurance company, but as the neighbor whose experience counts, who has a stock of proved cases of trouble at hand to back up his statements, and my experience has been that a vast amount can be accomplished, and it pays.

William Lincoln Smith,
Municipal Inspector.

Concord, Mass.

Jovian Rejuvenation in Eau Claire.—At a rejuvenation held at Eau Claire, Wis., on March 9, 39 candidates were initiated into the Jovian Order. A degree team from Minneapolis conducted the ceremony.

QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be received preferably within ten days of the date of publication of the question. Payment will be made for all answers published.

Questions.

No. 333.—ELECTRIC CAR HEATING.—Has any system of electric heating been developed for electric street cars, elevated or subway trains, which gives a more uniformly distributed heat than the electric coils now commonly used under the seats? I have heard many complaints on very cold days that the seats are uncomfortably hot while the floor is chilly.—A. P. G., Chicago, Ill.

No. 338.—GROUNDING OF MOTORS.—What is the best way to ground a group of motors? Can motors of different voltages be connected to the same ground plates, say in the case of 110, 220 or 440-volt alternating-current machines?—R. B., Jackson, Mich.

No. 339.—TELEPHONES ON POWER LINES.—What precautions should be taken in installing telephones whose line is on the same poles with 11,000-volt power lines? What special precautions should be taken for safety? Would it be practical and would the service be satisfactory if a grounded circuit were used instead of a metallic circuit for the telephone line?—R. F. C., Minersville, Cal.

No. 340.—THREE-PHASE VERSUS SINGLE-PHASE TRANSFORMERS.—If the three-phase transformer actually possesses all the advantages that are claimed for it, why is the three-phase distributing transformer not used instead of the single-phase on a larger scale? How do the two compare as regards reliability and cost?—N. T., Chicago, Ill.

Answers.

No. 322.—JOBBERS' TRADE NAMES.—Is the common custom of jobbers of putting their own firm name or some special trade name on articles (thus disguising the real manufacturer) regarded as good commercial practice? Does it promote sales? Does it not injure the interests of the manufacturer to have his products sell under several trade names?—W. T. K., St. Louis, Mo.

While it might be through neglect on his part, nevertheless, the writer of the present answer has never noticed it to be a *common* practice for jobbers to obliterate, with their own, the marks of the manufacturer on goods sold by the former. The writer is in possession of a number of catalogs (in both bulletin and bound-volume form) of representative jobbing houses; in none of these publications is any attempt made to represent standard manufactured articles as being of the jobber's own make. Again, though the writer has followed the proceedings of the more important societies (engineering, contracting, etc.) for the past five years, he has never seen the present particular matter brought up; though certain discussions could be extended to bear on this subject.

However, assuming such a custom to be evident, the writer believes that the matter should be weighed—in his opinion, the custom condemned. The attack can be made from several angles, the chief ones taking into consideration (1) ethics, (2) trade-mark law, and (3) co-operation.

That such a custom is *against* good ethical principles, being self-evidently misrepresentative, alone is sufficient to establish the first point's negation.

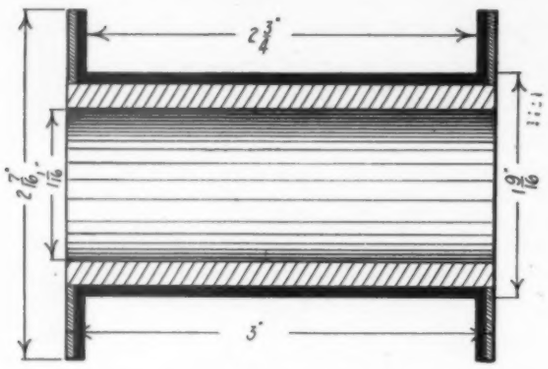
Considering the second point, it is that the custom conflicts with the rights of holders of specific trade-marks, the definition of the last being "a symbol consisting in general of a picture, a label, or a word or words, applied or attached to the goods of a trader [which term can be extended to include the manufacturer whose organization includes direct sales to the ultimate consumer, in competition with the so-called middleman] for the purpose of *distinguishing* them from the similar goods of other traders, and of *identifying* them as *his* goods, or of those of his successors, in the business in which they are *produced* or *put forward for sale*." And, though the trade-mark's chief purpose is to act as a deterrent against the *substitution* of inferior goods for those (generally of superior quality) indicated by the mark, it would appear to the writer that the owner of the mark should equally demand his *originality* rights. At any rate, Webster's definition of "trade name" does not include in its use the right to obliterate the trade-mark of another than the owner of the trade-mark. There is a wide literature on the interpretation of trade-mark law, but the writer cannot conceive of a technicality tending to weaken his foregoing conclusion based on the general definitions.

In considering the third point, co-operation,—and neglecting to regard possible cases in which the public's confidence in a local jobber overrides that in the manufacturer—the second and third questions in the above query can also receive attention. The question of the proper relations between the contractor and the jobber, on the one hand, and the manufacturer on the other, is one that has occupied a prominent place in the technical journals and in papers and discussions by exponents of these followings. While a large number of different suggestions, codes of ethics, etc., have been put forward for consideration and many adopted it might be said that in general these all pointed to co-operation. The writer can not see that the custom under discussion smacks of *united effort*. As regards the interests, other than those already considered, of the manufacturer, the following comments, which also affect "magnitude of sales," have arisen from the sources just mentioned: The contractor or jobber would be the first to admit that a firm of, say, lamp makers who did not advertise *their goods* to the general public as widely and effectively as possible would soon go out of business. They recognize that the more energetically the manufacturer cries aloud the merits of *his* goods, the more eager the public is to buy those goods bearing his stamp and the more business comes to the contractor and jobber. Attractive posters, show-cards, booklets, and pamphlets—this in addition to sometimes mammoth advertising campaigns in popular and other publications—are put forth by the manufacturer at considerable expense and distributed broadcast, and as a general thing any contractor or jobber whose field lies within the area covered may have an almost unlimited amount of this kind of advertising matter *with his own name and address* printed thereon (but the last not to be the elimination of the maker of the goods being pushed). The distribution of such literature does good to both parties concerned and is one of the most useful forms of co-operation between them.

It would be extremely poor business judgment to refuse the benefits of the above co-operation for the sake of a local term, and rather unfair to overfly the one flag with another in selling articles, possibly of the same manufacture, that have, however, no propaganda of the maker behind them. In conclusion, attention might be called to, say, the local (wholesale or retail) grocer: he does not overstamp "White Building Coffee" and sell it as "*His* coffee," or "50-Odd Varieties" as "His Pickles, etc."—and so on for other articles and other dealers.—P. B. W., Verbena, Ala.

No. 331.—SMALL LIFTING MAGNET.—I am looking for a small solenoid magnet that can lift about one pound with a one-inch stroke; it must be wound for not over 20 volts. If no magnet of this kind can be readily secured on the market, I would like to have the necessary data for constructing it myself.—F. A. K., Los Angeles, Cal.

From tests conducted on a series of open plunger-type magnets it has been found that the pull per ampere-turn per inch per square inch core cross-section is about 0.01 pound between the limits of 800 and 2,800 ampere-turns per inch per square inch of core cross-section. Thus a magnet energized with 10,000 ampere-turns and of a length of five inches will exert



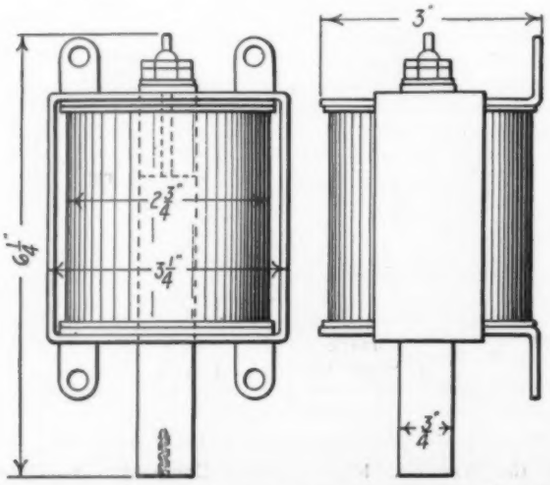
No. 331.—Fig. 1.—Coil for Small Lifting Magnet.

a pull of approximately 20 pounds on a core of one square inch cross-section. The ampere-turns per inch per square inch cross-section=2,000, and 2,000×0.01=20. This is the maximum pull exerted, and will not be exerted over the entire length of the stroke, but at that point where there is a maximum number of lines of force cutting a maximum number of turns. In order, therefore, to give a minimum pull of one pound, this coil is designed for a maximum pull of 2.3 pounds. The dimensions are as shown in the diagram (Fig. 1). The spool should be constructed of brass and insulated effectively to the size shown, then wound with 550 feet No. 23 double-cotton-covered copper wire. The core should be 1 inch in diameter by 3.5 inches long, and should be adjusted to operate with its end entered one inch within the coil. The magnet will take about two amperes at 20 volts.—J. H. M., Sharon, Pa.

The drawing (Fig. 2) shows the principal dimensions for the electromagnet in question. The following data will give all that is necessary to check up on the design, if desirable. The core is wound with No. 22 single-cotton-covered copper, 93.5 turns per layer and a total of 1,770 to 1,780 turns.

Energy required	18 watts
Current (18/20)	0.9 ampere
Resistance of winding (20/0.9)	22.2 ohms
Winding space (area)	2.41 square inches
Winding space (volume)	14.17 cubic inches
Resistance per cubic inch required (22.2/14.17)	1.57 ohms
Nearest to this is	No. 22 B. & S.
Turns per inch of No. 22	34
Turns per layer	93.5
Total turns	1,770 to 1,780
Ampere-turns	1,593
Length of wire	1,375.5 feet
Weight of wire	2.83 pounds

—H. E. W., Chicago, Ill.



No. 31.—Fig. 2.—Front and Side Views of Lifting Magnet.

No. 334.—Locked Cutout Cabinets.—In a large drafting room lighted by adjustable drop lamps over each drawing table considerable trouble has been caused by a rule keeping the cutout cabinet locked with only the electrician in charge of the key. When a fuse blows due to trouble on any drop lamp, the circuit for several tables is dead until the electrician can be found in some remote part of the factory. What is the best solution for the difficulty without violating the rule? —N. L. P., Milwaukee, Wis.

Probably the simplest way to secure relief from the delay incident to a blown fuse being located in a locked cabinet, on account of trouble on a lamp circuit, would be to localize the trouble by installing a fused rosette for each lamp. This would save the electrician time and labor in locating the fault, and allow only the lamp on the drop affected to go out. Adjustable drops usually receive rather severe service, and I have found that the kind of flexible cord and type of adjuster used determines their length of life. We consider that "slicked down" reinforced cord gives the most satisfactory results.—M. K., Passaic, N. J.

The inquirer is in a certain sense asking how he can violate the spirit of the rule without violating its letter. It is obvious that the cutout cabinet is kept locked with the intention that only responsible persons shall be able to replace and be accountable for the fuses therein. I think it is safe to conjecture that a cutout controlling a number of table lamps or drops that often blow the fuses, would very soon be bridged or overfused were the cabinet not kept locked, for if awaiting for the arrival of the plant electrician to make the repair is too great a strain on the patience of N. L. P. and his fellow draftsmen, it is not reasonable to suppose that they are going to wait until they can obtain the proper fuse plugs themselves and even supposing they did the occasion would arise when a fuse plug could not be readily obtained and then—oh! that bridge!

No! The best solution for your difficulty is to leave the cabinet locked and, if permissible in your district, fuse your rosettes. In this way only one lamp will be dead and if you bridge the rosette it will not do any harm, beyond blowing the fuse in the cabinet, putting out the rest of the lights on the circuit.—J. S., Victoria, B. C.

In mostly all places where the locked cabinets are installed there is considerable inconvenience caused by the delay in getting the electrician who has been intrusted with the keys of the cabinets.

Such a rule is a good one, however. For instance, if the cabinets were not locked, as soon as the fuses blow some unauthorized person might insert another fuse or a set of fuses of different amperage to that needed, and may either overfuse or underfuse the circuit, which is very undesirable, and the electrician would not know anything about it until trouble happened again.

If fuses are constantly blowing, the cause should be located and removed; either the circuit is overloaded, that is, the fuse may not be large enough, or there may be excessive heating near the fuse which would tend to blow sooner. If circuits are properly loaded, properly fused and well installed, there is very little danger of the blowing of fuses unless something out of the ordinary happens.

In our mill all such cabinets are kept locked and a key of each cabinet furnished to each of the three men in the electrical department, so that any one of them can be dispatched to the scene of trouble.

If it were merely the blowing of fuses, one of the men in the room could be given a few fuses and instructed how to use them. But where fuses are blown there is usually trouble on the circuit that must be removed before service can be restored and it is necessary that the electrician do this—W. T. E., Ansonia, Conn.

[No. 337.—Master Switch for House Lighting.—Of the numerous answers received to this question, the best ones will be published in an early issue.—Editor.]

NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Annunciator System for Placing Orders in Restaurants and Lunch Rooms.

The transmission of guests' orders from the waiters in lunch rooms and restaurants to the kitchen is usually accompanied with considerable confusion and very often with much noise. While this is particularly true in lunch rooms of the quick-lunch type, it also prevails in many of the better restaurants, in hotels and club houses. To overcome this, various systems of signals have been developed with more or less success, because if the waiter must actually go to the kitchen to place his order, considerable time is usually lost.

An electrical system to accomplish this with certainty and dispatch has now been developed. It consists of a number of sending stations similar to that shown in Fig. 1. These are made for mounting upon the wall, directly above the counter or on a post. Any number of these stations may be arranged, usually one for each dining room. All these are connected electrically to a receiving station or a cabinet shown in Fig. 2, which is located at the desk

Fig. 1.—Sending Station, Hotel and Restaurant Indicator.

Fig. 2.—Receiving Station, Hotel and Restaurant Indicator.

or convenient to the position of the chef or special checker in the kitchen.

On a comparison of the two illustrations shown herewith, it will be noted that both of these stations consist of equal numbers of panels, in this case 36; this number may be made whatever is required, from 16 to 100. On the sending station each panel consists of a name plate into which can be removably inserted the names of the various courses on the menu of the restaurant; the corresponding panels in the kitchen are similarly labeled. Each of the sending panels also includes a push button which is connected to the receiving panels so as to cause a small red lamp to be illuminated in the lower left corner of the panel, the latter feature being for the purpose of attracting the attention of the chef.

It will be observed in Fig. 2 that various numbers appear upon the little dials in the centers of the panels. These correspond to the number of orders that are "live." The arrangement is such that each time that a waiter presses the button on any particular panel at any sending station, the number in the corresponding receiving panel is successively increased for each depression of the sending button; thus the number shown indicates how many orders are to be filled. As soon as any of these orders have been filled and made ready for the waiters, they are passed by the chef who checks them off by pushing a button in the lower right portion of the panel and this causes the numbers to be successively reduced one at a time for each pressing of the button. In the meantime, however, the small red lamps remain lighted as long as any orders must be filled for any particular course.

This system works with precision and shows at a glance just what orders are to be taken care of immediately by the chef's staff; therefore, he can arrange the work among his assistants so as to have the orders filled in the most prompt manner. He also has a check on all of the orders being filled.

The electrical system by which this is accomplished is through a development of the annunciator principle and is covered by patents. All of the wiring from the various sending stations to the receiving cabinet in the kitchen is put in steel conduit so as to make it entirely waterproof and well protected. Any number of sending stations can be connected in parallel to one receiving cabinet. The names of the various courses and orders are easily changed and are protected by white celluloid. The system is easily installed because the actual wiring can be readily put in by practically any local contractor or electrician. All parts of the sending and receiving stations are well made and neatly finished. Metal parts are heavily nickel-plated. The plate box is made of cast aluminum. A number of these indicators have been in use with complete success for some time. The current required for their operation is small.

These hotel and restaurant indicators are manufactured by the Hamilton Manufacturing Company, Two Rivers, Wis. They are sold and distributed by Schaeffer & Weber, 1051 Marquette Building, Chicago, Ill.

BALL BEARINGS ON ELECTRIC MOTORS.

By F. E. Rogers, Jr.

Ball bearings are usually applied to machinery because of the power saving which they make possible. Machine builders early recognized the value of ball bearings as power savers, and their adoption as standard equipment has been consequently rapid and extensive. Although ball bearings have been applied to electric motors at a rate which compares favorably with other types of machinery, power saving has not been the principal reason. The question then arises: Why are ball bearings used on electric motors? There are several important reasons which it is the object of this article to discuss.

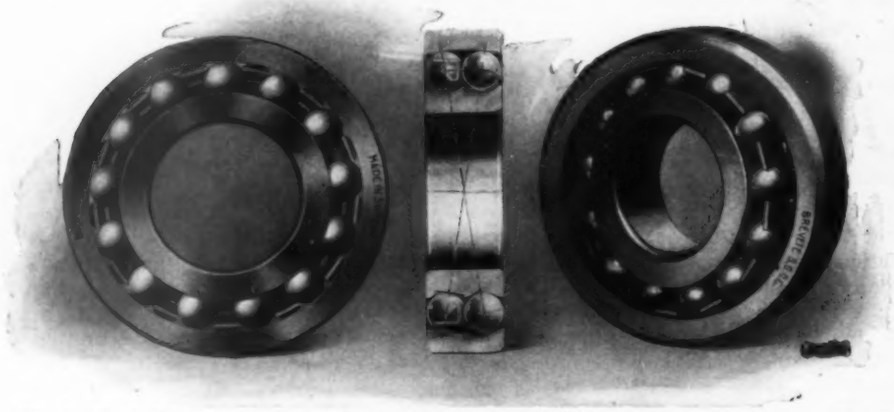


Fig. 1.—Typical Self-Alining Ball Bearing, Shown in Normal Position, in Section, and in Deflected Position.

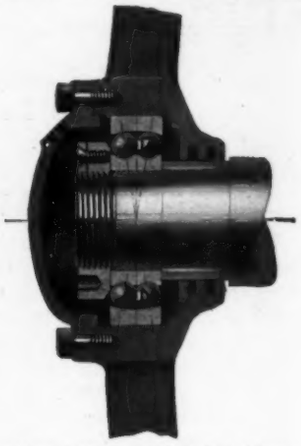


Fig. 2.—Sectional View of Bearing Housing, Showing Mounting of Bearing.

Construction of the Bearing.

In order that the reader may more readily appreciate the advantages to be derived from their use on electric motors, it would appear desirable to examine the mechanical construction of ball bearings. The radial bearing used on electric motors consists essentially of four parts; an outer race, an inner race, two rows of balls, and a ball retainer or cage. Referring to the sectional view of the bearing, it will be seen that the inner race contains two grooves, each ground to a radius slightly larger than the radius of the balls. The inner surface of the outer race is ground as part of a hollow sphere, the center of which lies on the axis of the shaft. The balls and inner race are thus free to rotate at any angle within this spherical outer race, without increasing the strain on the bearing. Thus the shaft may deflect, but it cannot bind the bearing. This "ball and socket" principle is invaluable in the electric motor, "because a bearing which cannot adjust itself to suit the shaft, requires extreme accuracy in fitting up, and the least inaccuracy in alinement and housings results in wedged and broken balls and abnormal wear."[1]

Regarding the strength of the material from which ball bearings are made, it should be realized that the crushing load of a one-inch Swedish crucible-steel ball is 97,000 pounds.

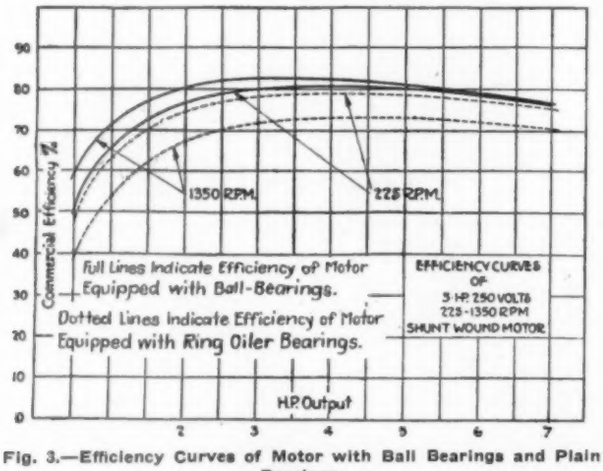


Fig. 3.—Efficiency Curves of Motor with Ball Bearings and Plain Bearings.

Add to this the fact that sliding action is replaced by rolling action, and the reason why ball bearings are so much more durable than bearings of the sleeve type becomes at once apparent. Note particularly that as all moving contact takes place within the bearing itself, no wear occurs on the shaft.

Small Amount of Attention and Lubrication Required.

The method of mounting the ball bearing provides for an oil-tight bearing housing, a feature which materially reduces the required amount of lubricant and consequent attention. Grooves, provided with felt washers, effectually seal the housing, preventing the escape of lubricant as well as the intrusion

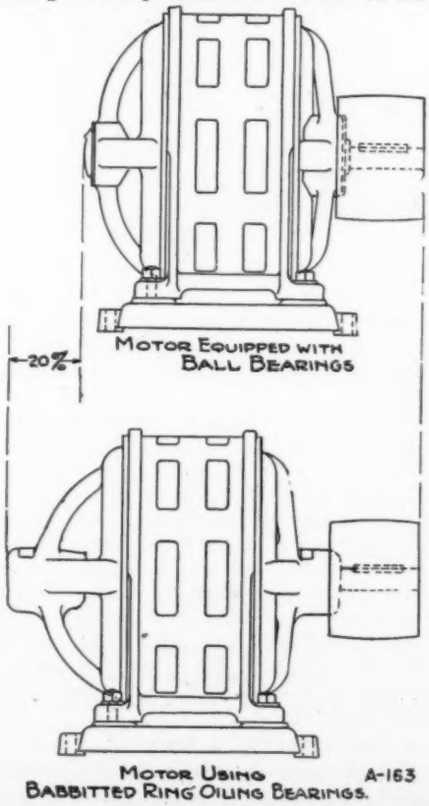


Fig. 4.—Comparison of Lengths of Ball-Bearing and Plain-Bearing Motors.

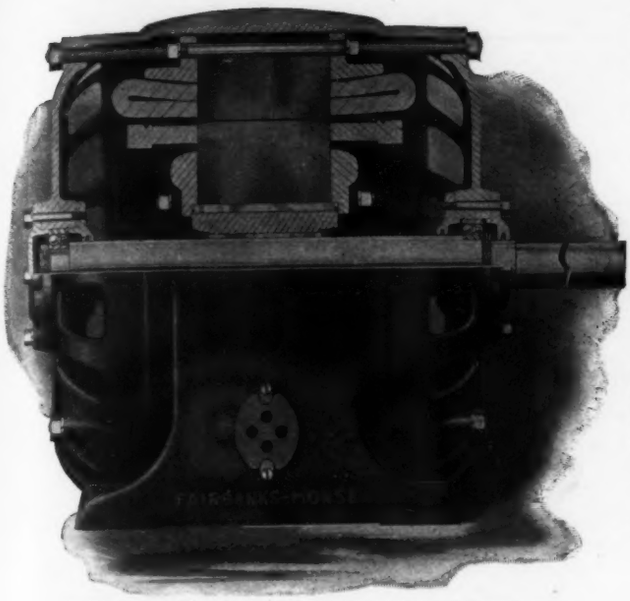


Fig. 5.—Partial Section of Motor with Ball Bearings.

of dust and foreign matter. (See sectional view of bearing housing.)

As no lubricant is wasted through leakage, commercial ball-bearing motors will usually run satisfactorily if oiled every three or four months. The required attention is correspondingly small, as it is not necessary to inspect the bearings except when they are oiled. In ceiling installations, ball bearings are particularly valuable, as it is not necessary to inspect them every time the motor is started: the operator need not concern himself about the possibility of oil rings sticking. The maintenance bill is, in consequence, considerably lower, the saving in lubricant alone being no small item. Aside from the occasional inspections, the only requisite for ball-bearing machines is a chemically neutral lubricant, free from acid or alkali, and of such consistency that it will circulate in the lubricant chamber. The action of the bearing provides thorough circulation of the lubricant, assuring long life to the bearing. Oil is recommended for horizontal machines operating at speeds in excess of 2,500 revolutions per minute, and in most cases in vertical motors; for low-speed machines a good grade of grease is preferred.

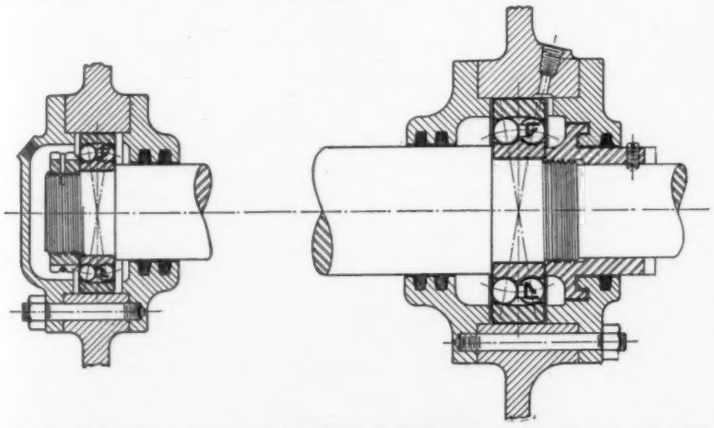


Fig. 6.—Special Dustproof and Waterproof Mounting for Use in Cement Mills and Other Dusty or Wet Places.

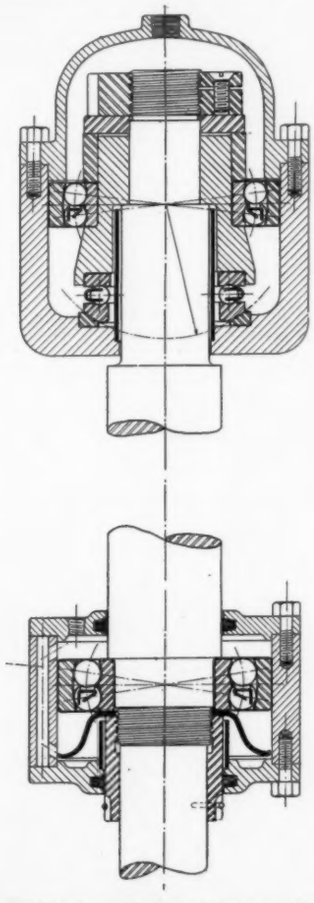


Fig. 7.—Radial and Thrust Bearings for Vertical Motor.

Uninterrupted Service.

Continuous service is an important feature of modern shop requirements. Ball bearings are tightly sealed; consequently frozen bearings, due to the interference of dust and lint with the circulation of the oil, are avoided. The small amount of friction to overcome and the freedom from binding in self-alining ball bearings, reduces the amount of heat generated with the result that the danger of overheated bearings and the resulting shutdown is eliminated.

Fire Risks.

In addition to the freedom from shutdowns, the use of ball bearings materially reduces the fire hazard, as many fires have their origin in hot bearings. The insurance companies appreciate the fire-preventive qualities of ball bearings and are staunch advocates of their use.

On direct-current machines the commutators remain free from oil, better commutation resulting. Freedom from sparking commutators is very desirable in flour mills, in coal mines, in textile mills, in wood-working plants, etc., because of the combustible dust which is usually present in these plants.

Efficiency.

Although, at first sight, there does not appear to be much room for improvement in mechanical efficiency, the fact remains that ball bearings do improve the efficiency, particularly where the load is overhung. When the motor is direct-connected, as in the case of the direct-driven centrifugal pump, motor-generator sets, etc., the pressure on the bearings is not great and the friction loss is correspondingly small, probably not more than four per cent. But when the motor drives through a belt or gear, the pressure on the driving-end bearing is greatly increased and the friction loss becomes appreciable. The accompanying efficiency curves were obtained from tests made by a motor manufacturer who equips his motors with either sleeve type or ball bearings at the option of the cus-

1 Andrew Gibson, in a paper on "Bearings of Electrical Machinery," read before the West of Scotland Branch of the (British) Association of Mining Electrical Engineers.

tomer. It will be seen that, although the difference in efficiency at minimum speed is not large, the improvement at maximum speed is worthy of consideration, amounting, for this motor, to 6.5 per cent at full load. This difference in efficiency is exceptional, as the friction loss of electric motors under ordinary running conditions is frequently not much over one per cent. But practically all of this loss may be saved by ball bearings, and manufacturers using them as standard equipment figure that even this slight saving will pay for the bearings within one year. Note that, whereas with plain bearings the efficiency decreased as the speed increased, the reverse was true of the motor when equipped with ball bearings.

Ball-bearing motors start with a minimum effort. Plain-bearing motors are frequently subject to excessive starting effort, when, having stood idle, the oil is pressed out from between the bearing lining and the shaft, and lubrication is not established until the machine is up to speed. Ball bearings are not subject to this disadvantage as they do not require an oil film to reduce friction; the function of the lubricant is to preserve the highly finished surfaces of the balls and races.

Reduced Length.

Babbitt bearings are usually designed with the box length two and one-half to three times the diameter of the shaft which they support. Contrasted with this, the length of ball bearings along the shaft is usually not over one-half of the shaft diameter. This feature allows a reduction of 10 to 27 per cent in the over-all length of the motor, an item of importance where space is at a premium, as it offers a material saving in floor space and aisle room.

Methods of Mounting the Bearings.

It is important that ball bearings be mounted properly. The inner race must have a tight fit on the shaft and should be permanently seated, by means of a locknut or distance piece, in a fixed position against the shaft shoulder. The outer race, on the contrary, should seldom be held rigidly in the housing. A sucking fit within the housing will permit the outer race to creep and insure a more perfect distribution of the load over the whole circumference of the race.

Where there is more than one radial ball bearing on the same shaft without a thrust bearing, one bearing only should be used to secure the shaft against end motion. In the electric motor this should be the bearing opposite the pulley end. The outer race of the other bearing should have ample clearance on both sides so that it will be free to locate itself laterally. On direct-current motors, the outer race of both bearings may be allowed endwise freedom, so as to permit sufficient end play to insure even wear on the commutator.

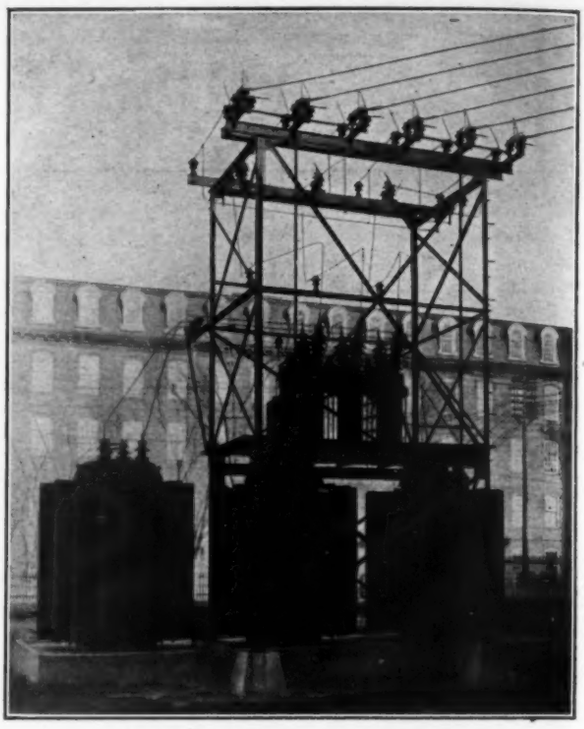
Fig. 7 shows the arrangement of the bearings for a motor employing a vertical shaft. The thrust bearing is seated in a washer which forms a spherical seat, the center of which coincides with the center of the radial bearing. Thus the two bearings form a completely self-alining unit.

If reasonable care is used in applying the bearings and in keeping them clean after installation, no trouble need be anticipated in using them.

The employment of ball bearings on motors is advancing so rapidly that it is evident that the old prejudices against them have been largely overcome. They have proved their worth both in this country and abroad. The greater compactness which ball bearings make possible, their durability and ease of application, the small amount of attention they require and the power which they save, all these have contributed toward their ability to accept the part which they have so successfully played in the field of modern machine construction.

Outdoor Substation for 6,000 Kilovolt-Amperes.

The outdoor substation illustrated in the accompanying cut is said to be the most simple high-voltage transformer station of 6,000 kilovolt-amperes capacity in operation. It is installed at Cohoes, N. Y., and serves power to one of the largest woolen mills in the world. The station was designed and



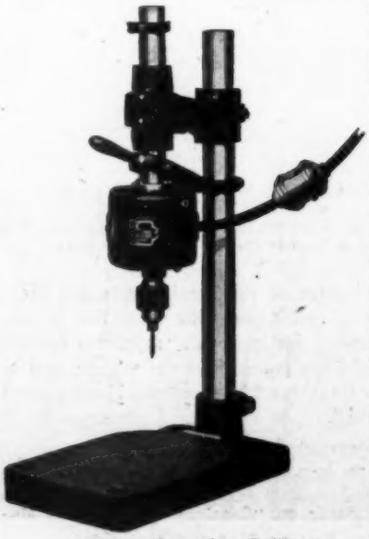
Outdoor Substation at Cohoes, N. Y.

built by the Railway & Industrial Engineering Company, Pittsburgh, Pa. The equipment consists of Burke horn-gap switches and Burke lightning arresters mounted on the top of the steel structure which carries the oil circuit-breakers. The illustration shows quite clearly the method of carrying the wiring and connections to the three 2,000-kilovolt-ampere Westinghouse transformers.

Dumore Motor-Driven Sensitive Drill.

Manufacturers of small specialties, in fact all manufacturers who are working up small parts, will be greatly interested in a small, high-speed sensitive drill that has been brought out by the Wisconsin Electric Company, Racine, Wis. This bench drill is motor-driven and direct-connected. It is equipped with a 13/64 Jacobs chuck and has a capacity in steel up to 3/32, and in brass, aluminum and wood up to 13/64.

This little drill is equipped with S. K. F. ball bearings and is extremely sensitive, owing to the special coil-spring mechanism column. It stands 18 inches high and has a two-inch stroke. The motor and bracket can be readily raised or lowered on the main column. The motor overhangs sufficiently to enable the operator to drill in the center of a six-inch circle.



Dumore Sensitive Drill.

The Dumore sensitive drill is extremely accurate and small holes can be drilled with great rapidity. This drill sells at a relatively low price and is furnished with motor, cord and plug.

INDUSTRY ACTIVITIES

Condit Electrical Manufacturing Company, Boston, Mass., manufacturer of electrical protective devices, is distributing a mailing card on its quick-delivery facilities.

Belden Manufacturing Company, Chicago, Ill. has prepared catalog supplements giving discounts and base prices, effective March 13, on its magnet and rubber-covered wire, cables, bakelite and other products.

The Universal Motor Company, Oshkosh, Wis., has issued Bulletin No. 20, on its "Universal" four-kilowatt generator set. This set is a direct-connected gas or gasoline-driven, four-cylinder unit designed for town or house lighting, battery charging and kindred uses.

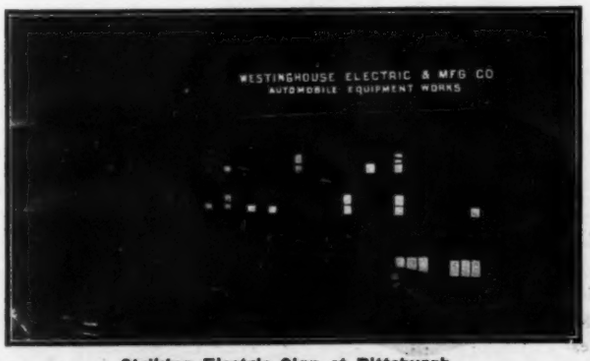
The Safety Insulated Wire & Cable Company, 114 Liberty Street, New York City, has issued its new price list, No. 1233, covering its line of National Electric Code standard lamp cord and flexible cables. Copies of the list will be mailed to anyone upon request.

The Beardslee Chandelier Manufacturing Company, 216 South Jefferson Street, Chicago, Ill., is sending out a letter giving a brief resume of the metal market. It is stated that the average advance in price of soft metal products since the European war has been 253 per cent. Changes in list-price discounts are announced.

The Union Metal Manufacturing Company, Canton, O., manufacturer of metal columns and standards, has issued catalog S-103, which is a 96-page loose-leaf catalog showing a complete line of standards for lighting business and residential districts and parks. A very complete line of standards for cluster lighting is also shown.

The Boustead Electric & Manufacturing Company, of Minneapolis, Minn., recently purchased from the Pillsbury Flour Mills its generating plant, consisting of two 150-kilowatt generators, equalizers, boosters and switchboards, which material the Boustead Company is putting in first-class running condition for future use. The company offers the above material, as well as a large line of other used apparatus for sale.

Westinghouse Electric & Manufacturing Company.—One of the most effective electric signs recently erected in the vicinity of Pittsburgh, Pa., is that shown in the accompanying illustration. It is erected on the Shadyside works of the Westinghouse Electric & Manufacturing Company, which plant is devoted to the manufacture of the starting, lighting and ignition equipments for gasoline automobiles. The letters are of the metal-channel type, the company name in three-foot letters, and the lower words in two-foot letters. To supply the illumination, 566 five-watt, 55-volt Mazda lamps are used. The sign was designed by the Westinghouse company, built and erected by the Federal Sign System (Electric) of Chicago, and the energy for lighting it is furnished by the Duquesne Light Company.



Striking Electric Sign at Pittaburgh.

Hughes Electric Heating Company, 215 West Schiller Street, Chicago, Ill., manufacturer of electric ranges, has opened a branch office at 333 Old South Building, Boston, Mass., with W. B. Pierce as manager. The entire Eastern sales work of the company will be carried on from this office. Mr. Pierce has been engaged in sales organization in the electrical industry for the past 12 years and brings to the Hughes company a fund of selling ideas and experience that will be of great value in gaining greater recognition for the company's appliances in the Northeastern territory.

The Wheeler-Arnold Company, Wittenberg, Wis., which recently succeeded the Wittenberg Cedar Company, announces that it has a good-sized stock of seasoned poles and will have a fairly large volume of new poles. The company produces most of its own poles and besides its Wittenberg yard it has eight other yards favorable for making prompt shipments. W. W. Wheeler, a well known lumber man of Des Moines, Iowa, is president of the company, W. L. Arnold, treasurer and general manager, William Gates, vice-president, J. M. Dusel secretary.

Electric Storage Battery Company, Philadelphia, Pa., recently maintained an exhibit in the Clark Street display window of the Commonwealth Edison Company, Chicago, that attracted a great deal of attention and elicited much favorable comment. The general idea of the exhibit was one of "Preparedness," the central exhibit being an "Exide" submarine cell, type U-29. Each of these cells weighs 1,128 pounds and is 12.75 inches wide by 20 inches long by 46.5 inches high overall; 120 of these cells is the usual equipment on the new L submarine boats, which boats have a displacement of 450 tons. The 120 cells of battery weigh approximately 68 tons. The complete battery of 120 cells has the following, approximate, ratings: 90 horsepower continuously for 20 hours, or 400 horsepower continuously for 3 hours, or over 825 horsepower continuously for one hour. These batteries can discharge momentarily at 2,000 horsepower. The unique feature of this new type of submarine battery is that each cell is a separate unit and each cell can be quickly removed from the battery compartment for repairs. Each cell is completely sealed and has two air inlet tubes into which air is drawn by a ventilating system, this system being connected by rubber tubing to an outlet in each cell. In passing out, the air diluted with hydrogen gas is conducted through a number of perforated screens of hard rubber which remove and return to the cell any entrained stray electrolyte. The filling plug of each cell is removable by making a quarter turn which throws a valve, so that the cell cannot be overfilled. A battery of this type is said to be absolutely proof against explosion, due to hydrogen gas; and on account of the method of sealing the entire battery can be completely emersed in salt water to the depth of several inches above the cell covers and no salt water can get into the cells. In addition to the exhibit of the submarine cell, there were shown in this window a tray of Ironclad batteries for use in electrically propelled vehicles; some Exide batteries for use in automobile starting, lighting and ignition; some Chloride cells for use on alarm and clock circuits and several other types of batteries.

LATEST APPROVED FITTINGS

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

BUSHINGS, Porcelain.—Thomas & Betts Company, 105 Hudson Street, New York, N. Y.

T. & B. screw-threaded porcelain bushings with stamped-steel locknuts; catalog Nos. 1, 2, 2½, 3, 3½.

Listed January 3, 1916.

CUTOUT BASES, Plug Fuse.—C. & P. Electric Works, 92 Hayden Street, Springfield, Mass.

Barrier cutouts designed to be made up into panels and having upturned edges to form a barrier around wiring gutter. Furnished with sectional or solid busbars.

C. & P. 0-30 amperes, 125 volts, 2 and 3-wire main, double 2-wire plug fuse branch cutout bases, catalog Nos. B2587, B2199, with end pieces, catalog Nos. B2587E, B2199E.

Standard for use only up to 18 circuits with sectional busbars, and 40 circuits with solid busbars.

Listed January 12, 1916.

FIXTURES, for Use with Gas-Filled Lamps.—E. H. Baxter Sales Company, 208 North Fifth Avenue, Chicago, Ill.

Chain pendent type. 100-200 watts, 110 volts, catalog No. 813. 200-300

Porcelain Bushing.—Thomas & Betts Company.

watts, 110 volts, catalog No. 1013. 400-500 watts, 110 volts, catalog No. 1217.

Listed February 1, 1916.

FIXTURES, for Use with Gas-Filled Lamps.—Harter Manufacturing Company, 1132 West Austin Avenue, Chicago, Ill.

Ceiling type De Luxlite, 500 watts, catalog No. 2923½.

Listed February 1, 1916.

FIXTURES, Vapor-proof.—Appleton Electric Company, 212 North Jefferson Street, Chicago, Ill.

Type G.

Listed February 1, 1916.

FIXTURES, Vapor-proof.—Crouse-Hinds Company, Syracuse, N. Y.

Series V, VH and Type WV.

Listed February 1, 1915.

FIXTURES, Vapor-proof.—McGill Manufacturing Company, Valparaiso, Ind.

McGill type.

Listed February 1, 1916.

FIXTURES, Vapor-proof.—Frank W. Morse, 293 Congress Street, Boston, Mass.

Morse, catalog No. 26.

Listed February 1, 1916.

FIXTURES, Vapor-proof.—V. V. Fittings Company, Philadelphia, Pa.

Type 5.

Listed February 1, 1916.

GROUND CLAMPS.—Thomas & Betts Company, 105 Hudson Street, New York, N. Y.

A copper strap ground clamp with formed soldering lug, a malleable iron rider and a clamping bolt. Marked "T. & B.," adjustable for pipes up to 3-inch sizes.

Listed February 15, 1916.

HEATERS, Electric.—Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Electric linotype and intertype pots.

Electrically heated melting pots and control panels for the melting and automatic temperature regulation of type metal. Maximum rating, 1,600 watts, 250 volts, alternating or direct current.

Standard when installed to form part of a typesetting machine.

Listed February 5, 1916.

PICTURE MACHINES AND APPLIANCES.—Kinoikon Apparatus Corporation, Bridgeton, N. J.

Kinoikon projector. Type E, two types; one for hand operation, the other driven by a special motor and equipped with mechanical speed controller, and with an automatic device for stopping motor in event of breakage of or lack of tension on film.

Listed February 16, 1916.

ROSETTES, Link-Fuse.—Manhattan Electrical Supply Company, 17 Park Place, New York, N. Y.

Mesco, 2 amperes, 125 volts.

Cleat, catalog No. 6565.

Listed February 1, 1916.

ROSETTES, Fuseless.—Manhattan Electrical Supply Company, 17 Park Place, New York, N. Y.

Mesco, 3 amperes, 250 volts.

Cleat type, catalog No. 16445.

Molding type, catalog No. 16446.

Concealed type, catalog No. 16447.

Listed January 31, 1915.

SWITCHES, Automatic.—Owen T. Snyder & Company, Columbus, O.

Safety elevator door switch.

Emergency switch.

Consisting respectively of:

An inclosed, series, quick-make-and-break switch automatically operated by elevator door, connected in series with car controller, so that car cannot be started until doors are properly closed, 2 amperes, 250 volts.

An inclosed, double series, spring-actuated switch normally open, automatically operated by breaking of glass, one side connected across door switches, and other side in series with signaling device. 2 amperes, 250 volts.

Listed February 16, 1916.

SWITCHES, Pendent Snap.—Pass & Seymour, Solvay, N. Y.

P. & S. switches with pull-chain mechanism, 3 amperes, 125 volts; 1 ampere, 250 volts; catalog No. 3006.

Listed January 5, 1916.

SWITCHES, Push-Button Flush.—The Trumbull Electric Company, Plainville, Conn.

Four-way; 5 amperes, 250 volts; 10 amperes, 125 volts; catalog No. 204.

Listed February 5, 1916.

THERMOSTAT CONTROL FOR ELECTRIC CAR HEATERS.—Thermo Electric Regulator Company, 617

Pendent Snap Switch.—Pass & Seymour.

West Jackson Boulevard, Chicago, Ill.

Consisting of an electromagnetically operated switch, controlled by contacts in a mercury thermometer and a relay. All operating parts are inclosed in a metal case.

This system is judged to be suitable for use when wiring is installed in accordance with Rule 40 of the National Electrical Code.

Listed February 16, 1916.

THERMOSTAT VALVE CONTROL.—Gold Car Heating & Lighting Company, 17 Battery Place, New York, N. Y.

Temperature-regulating system for steam or hot-water radiators. Consisting of solenoid-operated radiator valves, each requiring 10 watts at 125 or 250 volts direct-current and controlled in groups of from one to four magnet valves in multiple by special thermostatic wall switch.

Standard for use when the wiring is installed in accordance with Class C rules of the National Electrical Code.

Listed February 5, 1916.

PERSONAL AND BIOGRAPHICAL

MR. FRANK T. WYMAN, formerly chief engineer of the Pittsburgh Transformer Company, Pittsburgh, Pa., has accepted a similar position with the Packard Electric Company of St. Catharines, Ontario, Can. Mr. Wyman is a graduate of the University of Vermont. After his graduation he was a member of the faculty of the electrical engineering department of Drexel Institute, Philadelphia, Pa., for two years, and the University of Pittsburgh for two years. For the past seven years Mr. Wyman has been connected with the Pittsburgh Transformer Company, and has been chief engineer of that company since 1912.

MR. W. E. HASELTINE, who was elected president of the Wisconsin Electrical Association at its annual meeting in Milwaukee on March 17, is secretary and general manager of the Ripon Light & Water Company. Mr. Haseltine was born in Schofield, Wis., in 1874. He received his engineering

W. E. Haseltine.

education at the Massachusetts Institute of Technology and after leaving school accepted a position in the Alaska mining fields. He later, with his father, organized the Ripon Light & Water Company and has been actively connected with this company continuously for the past 16 years. Mr. Halestine is also secretary and manager of the Markesen Electric Company, which is controlled by the Ripon Company. He has been long identified with the Wisconsin Electrical Association and in 1914 was elected second vice-president, being advanced in 1915 to the offce of first vice-president. He was also vice-president of the Wisconsin Gas Association and is a member of the American Water Works Association, the Wisconsin Engineering Society and other organizations.

MR. C. E. ROBERTSON has recently been appointed sales manager of the General Vehicle Company, with headquarters at the general offices of the Company in Long Island City, N. Y. He succeeds MR. C. W. SQUIRES, JR., who has resigned that position. Mr. Squires will remain with the Gen-

C. E. Robertson.

eral Vehicle organization and will take at his own request an important position in the West. Mr. Robertson is an expert sales director of unusual experience and executive ability. His broad training should stand him in good stead at a time when the General Vehicle Company is not only expanding its sales organization but planning to increase its lines of gasoline and electric trucks.

MR. JAMES B. OLSON, who has been identified with the electric wire and cable industry for many years, recently has been appointed general sales manager of the Habirshaw Electric Cable Company, 10 East Forty-third Street, New York City. This company is a consolidation, made several weeks ago, of the Habirshaw Wire Company, the Electric Cable Company and the Waterbury Company. Mr. Olson first entered this field as a member of the sales organization of the New York Insulated Wire Company. Later he accepted a similar position with the Habirshaw Wire Company, remaining with this company for 20 years. During the last 18 years of that period he has been sales manager of the Habirshaw Company.

James B. Olson.

OBITUARY.

MR. JOHN C. MANLEY, assistant construction superintendent of the Commonwealth Edison Company, Chicago, Ill., dropped dead March 17 while playing handball in a Chicago gymnasium. Mr. Manley, who gave every appearance of a man in the very best of health, occasionally indulged in a little exercise before luncheon. He was actually playing the game when he toppled over, and apparently died instantly. Mr. Manley exemplified his name in every sense of the word. He was a manly man. He was active and alert, eminently fair and just, and fond of athletic sports. It may be remembered, perhaps, that in the famous baseball game between the East and the West at the Atlantic City convention of the National Electric Light Association in 1909, it was Mr. Manley, a strong amateur player, who made the three-base hit that resulted in the

John C. Manley.

Western team winning the game. Mr. Manley was born in 1869. He had been with the Commonwealth Edison Company and its predecessor, the Chicago Edison Company, since June, 1895, beginning as a wireman and rising to the position he held when he died. He was one of the most popular men in the company, and his death came as a great shock to many. Always quick-thinking and enterprising, Mr. Manley was selected to direct many special construction installations. Mr. Manley was a man of considerable inventive ability, and a number of improvements in the art of electrical wiring are to be attributed to him. He was an associate of the American Institute of Electrical Engineers, a member of the Jovian Order, in which organization he was Second Tribune for Chicago. He was second vice-president of the Electric Club-Jovian League, a member of the Knights of Columbus, and other fraternal organizations. He was prominent in affairs of the Commonwealth Edison Company Section of the National Electric Light Association, and was at one time president of this Section. Besides a widow he leaves two sons, both of whom are at college.

CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

MONTPELIER, VT.—The Vermont Public Service Commission has approved an issue of $250,000 in stock by the Montpelier & Barre Railway Company.

ST. JOHNSBURY, VT.—C. C. Braley, of this city, T. W. Chase, of Passumpic, and others have incorporated the Essex Storage Electric Company with a capital of $200,000. The company plans a large hydroelectric development at the town of Victory on the Moose River, from which energy will be transmitted to St. Johnsbury and neighboring communities for power and lighting purposes.

EASTHAMPTON, MASS.—J. N. Lyman, manager of the Easthampton Gas Company, states that the company is planning to install two transmission lines to its power plant at Mount Tom, a distance of 2.5 miles.

SHIRLEY, MASS.—The Shirley Electric Company proposes to build a 13,000-volt transmission line between this town and Pepperell, about five miles of which would be on public highways.

SPENCER, MASS.—The Bigwood Woolen Company is installing electric motors to run its yarn making department, to enable operation with night and day shifts.

ROCKVILLE, CONN.—W. A. Howell is chairman of a committee that plans to install a white way around Central Park. About 20 two or three-light standards will be purchased.

LANSDALE, PA.—The City Council has revived the question of moving the Lansdale Electric Company's plant from its present location in this city to the town of Chalfont, six miles east of here, where water power is available.

NEWTON, PA.—The City Council has approved a five-year contract with the Bucks County Electric Company for lighting the main streets here.

GRATZ, PA.—The Johnson Construction Company, of Pittsburgh, has been granted a franchise for the construction of an electric lighting system here.

WILMINGTON, DEL.—The Northwestern Power & Manufacturing Company has been incorporated here with a capital of $750,000 for the purpose of acquiring real estate, power sites and water rights for the generation of electrical energy. The incorporators are H. E. Latter, N. P. Coffin and C. M. Egner.

WASHINGTON, D. C.—The electrification and double-tracking of the Chesapeake Beach railway is being considered by a group of men identified with the Merchants' Bank of this city, according to report. The electrification of the railway would mean the building of a power plant on the banks of the Patuxent to generate electricity for Chesapeake Beach as well as for the railway line running there.

RADFORD, VA.—The Enterprise Power & Manufacturing Company will be the name of the new company to construct an electric lighting and power plant here. Oren Dodds will be general manager.

WILLIAMSBURG, VA.—The City Council has received an application from Mr. Davidson of Richmond for an electric lighting and power franchise in Williamsburg.

BUFFALO, N. Y.—The Buffalo General Electric Company has filed application with the Public Service Commission for authority to issue $3,625,000 in bonds, to be used for the construction of its steam-electric plant at Tonawanda, work on which has already been started.

COHOES, N. Y.—The Cohoes Electric Light Company has asked the Public Service Commission to extend its transmission lines to Watervliet and Green Island.

POUGHKEEPSIE, N. Y.—As a part of the plan to extend the electric zone of the New York Central railroad from Harmon northward to Poughkeepsie the old tunnel at Storm King will become a thing of the past. The preliminary work along this line has already been started by the engineers of the road and a number of surveys have been made.

SYRACUSE, N. Y.—Mayor Stone is considering the advisability of installing an electric lighting system in Schiller Park.

TROY, N. Y.—Rehabilitation of the municipal lighting plant is being considered by city officials.

FREEHOLD, N. J.—The Monmouth Light Company, of this city, has made application to the City Council for a long-term contract for lighting the city. Extensions will be made to the system if the contract is approved.

SPENCER, W. VA.—R. G. Wieland, of Audubon, Iowa, has purchased the power plant of the Robey Electric Company, of this city. Extensions and improvements are being planned by the new owner.

LEAKSVILLE, N. C.—The Leaksville Light & Power Company is planning to build and equip a distributing station. Power will be purchased from the Southern Power Company, of Charlotte.

MARSHALL, N. C.—A hydroelectric development of 1,200 horsepower is being planned by the Capitola Manufacturing Company, of this city.

ATLANTA, GA.—The aldermanic board has passed a resolution providing for 19 additional electric lighting standards on Alabama Street.

ATLANTA, GA.—The contract under which the Federal Construction Company and the Atlanta & North Georgia Railway are seeking a franchise for electric lines on certain streets in connection with proposed construction of interurban line between Atlanta and Creighton, Ga., has been submitted to the city attorney.

METTER, GA.—An election will be held March 30 to vote on the question of issuing $8,500 bonds to construct an electric lighting plant here.

CLEARWATER, FLA.—The General Utilities & Operating Company, headed by J. C. Lucas, of Baltimore, Md., has purchased the property of the Clearwater Lighting Company and has made final arrangements for taking over the concern.

NORTH CENTRAL STATES.

CANTON, O.—The Canton Electric Company, under due authority from its stockholders, will change its name to the Central Power Company, increase its capital stock from $2,500,000 to $12,500,000, and proceed immediately with the acquisition and construction of additional plants and interests for the purpose of operating electrical lighting and power plants through Central and Southern Ohio. The increase in capitalization, which is subject to the approval of the Public Utilities Commission, will enable the company to acquire the Ohio Light & Power Company and the Sunnyside Electric Company, with such other companies as may be decided on later. All of the companies named are understood to be controlled by the American Gas & Electric Company.

CLEVELAND, O.—Legislation authorizing a bond issue for the extension of the municipal electric lighting plant has been introduced in the City Council. The Commissioners are considering a proposal to supply power to the Cleveland Railway Company, and authorization has been asked for an extension of the Cedar Avenue power plant.

HAMILTON, O.—The report of the superintendent of the city electric plant recently submitted to Service Director Garver states that repairs and improvements required to place the plant in good shape will cost about $68,515. New lines and pole construction and the installation of a pumping system are among the items required.

LIMA, O.—Henry Mack, of this city, has acquired a site for a modern fireproof garage, with an adequately-equipped repair shop. No elevator will be used.

MIDDLETOWN, O.—The purchase of the Middletown Gas & Electric Company and the Franklin Electric Company properties by the Ohio Electric & Gas Company, incorporated recently at Lisbon, O., is one of the first steps toward the consolidation of interests through which the new company proposes to market the production of a large power plant to be constructed between Middletown and Hamilton. Charles A. Munroe, of Chicago, is one of the promoters of the new company. The financial plans will be presented to the Ohio Public Utilities Commission for approval in a short time.

READING, O.—The Board of Education will receive sealed bids until noon of April 5 for the various work involved in completing the new Reading public school. Plans and specifications are on file with the architects, Garber & Woodard, of Cincinnati, and with the board. Separate bids may be submitted for the electrical work.

REPUBLIC, O.—Plans are being discussed by Mayor Gilcher and other city officials for the installation of an electric lighting plant here.

SPRINGFIELD, O.—The Western Union Telegraph Company has secured the permission of the city authorities to make the necessary excavation incident to the installation of the clock and call systems in the new Hotel Shawnee. The company has completed a considerable amount of underground work in the city, and connections with the new building will be underground.

COLUMBIA, IND.—The Common Council will receive sealed bids March 27 for furnishing of electric energy delivered at the municipal electric light plant for supplying light and power to Columbia for a period of 20 years, beginning January 1, 1917. Edward E. Erdman is city clerk.

GREENSFORK, IND.—The Greensfork Electric Company has been organized with a capital of $1,500, by H. H. Fagan and others, to supply electric service here.

MADISON, IND.—The Public Service Commission has granted authority to the Madison Light & Railway Company to issue $13,000 in securities for new construction in its power plant.

BELLEVILLE, ILL.—A committee appointed to investigate the feasibility of a municipal lighting plant has reported that the first estimated cost of $150,000 will have to be raised to $272,000, which does not include the cost of installation of underground conduit.

DANVILLE, ILL.—A resolution providing for the placing of the proposition to establish a municipal light plant in Danville on the city election ballot was adopted without a dissenting vote, as was also the proposition to bond the city for $200,000 to pay for the establishment of such a plant.

FRANKLIN, ILL.—The Public Utilities Commission has granted a certificate of convenience and necessity to the Central Illinois Public Utilities Company to rebuild the electric lighting plant here.

HEBRON, ILL.—The L. E. Myers Company, of Chicago, has purchased the gas plant of the Hebron Gas Company. It is the intention of the former company to operate the gas plant until July, when facilities will be ready for the operation of an electric lighting plant.

HEYWORTH, ILL.—The Heyworth Electric Light & Power Company, G. W. Powell, president, is planning to install an ornamental lighting system on Main Street.

OTTAWA, ILL.—The members of the Rotary Club having in charge the lighting of LaSalle Street south of Main Street and the Illinois bridge and approaches are planning to extend the ornamental lighting system to these points.

LAPEER, MICH.—The question of establishing a boulevard lighting system is being considered by Mayor Fiary and others.

MONROE, MICH.—The question of issuing $90,000 electric light bonds will be submitted to vote April 3.

SODUS, MICH.—A number of leading

citizens of Sodus are considering the erection of an electric lighting plant on Pipestone Creek to furnish service here.

ZEELAND, MICH.—The City Council has decided to buy poles and install a boulevard lighting system along the main street here.

COLFAX, WIS.—The Colfax Light & Power Company has been organized with a capital of $25,000 by C. O. Larson, W. R. Larson and M. B. Larson.

LA CROSSE, WIS.—The County Commissioners of Whitman County have been petitioned by Harry G. Wilson for a franchise to construct and operate an electric lighting and power system in the town of La Crosse.

EYOTA, MINN.—The question of issuing $2,500 electric-light improvement bonds will be submitted to the voters at the spring election.

FREEPORT, MINN.—A new telephone line, about 13 miles long, will be built in the spring. Christ Fuchs and Leonard Scheunemann, managers.

ST. CLOUD, MINN.—St. Joseph's Rural Telephone Company has authorized the secretary to purchase necessary supplies for construction of telephone work at Jacobas Prairie.

GRINNELL, IOWA.—The Iowa Light & Power Company has been organized with a capital of $1,000,000. A large modern building will be erected.

DAVENPORT, IOWA.—The Tri-City Railway Company is contemplating extending its lines. Address F. E. Wettstein, representative of firm.

HUMBOLDT, IOWA.—Formation of an electric power syndicate second in size only to that which operates the power plant at Keokuk, Iowa, has been announced by officers of the new concern. According to the statement the company will be known as the Northern Iowa Gas & Electric Company and its formation will involve the expenditure of several millions of dollars. Eastern capital, it was said, is behind the project. With the large power plant of the Northern Iowa Power Company at Humboldt as a nucleus, plants will be established in 13 different communities.

ST. LOUIS, MO.—The Cupples Station Light, Heat & Power Company, Hugo Wurdack, president, is to increase its capital stock, to permit the company to build a large power generating plant.

ABILENE, KANS.—The Riverside Light & Power Company is considering plans to extend its transmission lines north to Oakhill and intermediate towns and south to Harrington and Hope. Address R. B. Gemmill, superintendent.

HANOVER, KANS.—The Hanover electric light plant recently was sold by Fred Meyn to James Barry, of Odell, Neb. The new owner expects to build transmission lines to Odell, Landham and Diller, Neb., and supply the energy from the Hanover plant.

HOLTON, KANS.—Contracts have been signed by the municipal electric lighting plant of Holton for the erection of transmission lines and the sale of energy to the towns of Circleville, Soldier and Havensville. The contracts for electric service cover a period of 20 years, and the price to be paid for energy varies from 4.5 to 5.25 cents per kilowatt-hour, depending on the amount desired in any one month.

EUREKA, S. D.—Articles of incorporation have been filed for the Citizens' Light & Power Company at Eureka by Christian Volander, E. A. Warner and others. The capital stock is $25,000. An electric lighting and power plant will be built and operated by the company.

SOUTH CENTRAL STATES.

HAZARD, KY.—Electric lighting service will be furnished to this rapidly growing coal-mining center by the Kentucky River Light & Power Company.

LAGRANGE, KY.—The franchise for a new electric lighting plant has been sold to Adams & Company, of Sulphur, Ky. The company proposes to give continuous service and will be allowed eight months in which to get the plant installed and in running order.

PIKEVILLE, KY.—New equipment has been purchased for the Sandy Valley Light & Power Company to supply the city with continuous service. L. L. Stone is manager.

HARRIMAN, TENN.—Right of way for construction of a transmission line to this city has been obtained by the Dayton Light & Power Company and service is to be supplied shortly. The city has given up a project for a municipal plant, it is stated. The Dayton company is owner of the Rockwood power plant and is a subsidiary of the Tennessee Power Company.

LIVINGSTON, TENN.—The Livingston Light & Power Company has been organized with S. O. Kennedy, of Schenectady, N. Y., president, for the purpose of furnishing electric service to several towns.

SMITHVILLE, TENN.—The chief engineer and promoters of the Nashville & Smithville electric railroad are buying right of way and taking other preliminary steps necessary for the building of the road. W. B. Foster, of Smithville, is interested in the project.

BIRMINGHAM, ALA.—The voters here will be called upon shortly to decide upon issuing bonds to increase the capacity of the present municipal power plant in North Birmingham. Commissioner Barber is urging the issue. The possibility of increasing the size of the plant has been under consideration for some time.

NEWPORT, ARK.—The Newport Water, Light & Power Company has filed notice of an increase of capital stock from $100,000 to $125,000. The company has reorganized its board of officials, A. N. Walker now being president. Extensions of service are being planned.

RUSH, ARK.—Ambrose Estes, promoter of the Rush townsite, states electric lighting service will be installed this spring by a local company. The plant will be installed at the Edith mill.

ENID, OKLA.—The City Council is making plans to increase the facilities of the municipal electric lighting system.

STROUD, OKLA.—The Benham Engineering Company, of Oklahoma City, is preparing plans for the reconstruction of the local lighting and water systems, $20,000 in bonds having been voted for that purpose.

COOPER, TEX.—The Cooper Electric Company, E. D. Broadhead, manager, is planning to make extensions of its transmission lines.

IRENE, TEX.—The town of Irene may soon have 24-hour electric lighting and power service if plans now under consideration by the Texas Power & Light Company are carried out.

LOCKHART, TEX.—The Citizens' Water Works & Lighting Company is being organized for the purpose of building a water works and electric lighting plant.

M'KINNEY, TEX.—The Texas Power & Light Company, of Dallas, which recently purchased the two local electric light plants for a total consideration of about $100,000, will extend the lighting system.

SEGUIN, TEX.—The Seguin Electric Light & Power Company, O. A. Gafford, manager, is building a new power house, in which will be installed a turbogenerator to deliver about 200 horsepower. The company is making a campaign on electrical appliances, especially cooking apparatus.

DATES AHEAD.

American Society of Mechanical Engineers. Spring meeting, New Orleans, La., April 11-14. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York City.

American Electrochemical Society. Semi-annual meting, Washington, D. C., April 27-29. Secretary, J. W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Section, N. E. L. A. Annual meeting, Dubuque, Iowa, May 10-12. Secretary, W. H. Thompson, Jr., Des Moines, Iowa.

Missouri Association of Public Utilities. Annual convention, May 11-13, on board boat leaving St. Louis May 11. Secretary, F. D. Beardslee, 315 North Twelfth Street, St. Louis, Mo.

Southwestern Electrical and Gas Association. Annual convention, Galveston, Tex., May 17-20. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

National Electric Light Association. Annual convention, Chicago, Ill., May 22-26. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York City.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., June 6-8. Secretary, R. B. Fowles, Pine Bluff, Ark.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

WESTERN STATES.

BIG SANDY, MONT.—The power lines of the Great Falls Power Company in this city are to be extended into the Riney addition.

DOOLEY, MONT.—Lloyd Goss, of Hannaford, N. D., has purchased the local electric lighting plant, and expects to make improvements.

TEMPE, ARIZ.—At a special meeting of the City Council, the committee on street lighting reported on the proposed municipal lighting plant, and the matter was taken under advisement.

PROVO, UTAH.—A notice of application by Caleb Tanner to change the nature of use of five cubic feet per second of water from the Provo River will be contested by Provo City and by canal companies on the south side of the river. The original application was for water for electric power purposes to be used at a point near the mouth of Provo canyon. Tanner's application for change of use provides for the water to be taken on Provo bench for irrigation, which, if granted, would prevent it from being used for irrigation in the canals south of the river. Provo city also has applied for the same water for its contemplated municipal lighting plant.

SALT LAKE CITY, UTAH.—Eighteen miles of land bordering the Snake River in Idaho has been withdrawn for power sites by the government, according to a communication received from Washington, D. C., by the local United States land office. The land withdrawn is in Township 3 North, Ranges 41, 42 and 43 east of the Boise meridian.

SALT LAKE CITY, UTAH.—It is announced from the office of the general manager of the Utah Light & Power Company that construction will shortly begin on a 70-mile extension of its power lines from Provo to Price and other points in Carbon County, to furnish coal mines there with power at 44,000 volts. The necessary outlay is estimated at $500,000. Chief Engineer M. Cheever, with A. B. Cudebec, W. F. Jennens and J. L. Mess of the engineering department, have just returned from a trip over the proposed route. Five months is the time required for completion of the improvement.

ALBION, IDAHO.—A certificate of public convenience and necessity has been granted this city for the operation of a municipal electric lighting plant.

WALLACE, IDAHO.—The Hector Mining Company is preparing to install electric power to take the place of water power in running its compressor.

VALDEZ, ALASKA.—The Inter-Mountain Traction & Power Company has been organized and incorporated under the laws of the state of Washington to utilize power generated by the Illes power plant located across the bay from Valdez. Alfred B. Illes is manager of the new company, which plans the construction of a distributing system in Valdez and the construction of transmission lines later to the mines in the immediate vicinity of Valdez.

CHELAN, WASH.—According to recent reports, the Great Northern Railway Company plans to begin, in the immediate future, actual construction on a large hydroelectric power plant at Lake Chelan, same to entail the expenditure of about $3,000,000. Lake Chelan is in the heart of the Cascade Mountains. According to reports, the power to be developed will be used by the railway company in electrifying its line from Spokane to Seattle.

COULEE CITY, WASH.—The Grant County Power Company has been granted a franchise to construct a pole and conduit system for the transmission of electrical energy for power and lighting purposes.

COUPEVILLE, WASH.—The local electric light plant is to be enlarged and improved this spring, according to W. C. Cheney, owner.

EVERETT, WASH.—The city attorney, acting under instructions from the City Council, has instituted proceedings against the local water plant, owned and operated by the Everett Railway, Light & Water Company. The step is the initial one to be taken by the city in acquiring possession of the system, which is to be condemned, appraised and taken over by the City of Everett and operated as a municipal utility. Extensive improvements and additions will then be made to the plant.

SEATTLE, WASH.—L. B. Youngs, Superintendent of Water, reports the Puget Sound Traction, Light & Power Company, of Seattle, of the Stone & Webster interests of Boston, has turned into the city treasury $8,000 for damage done to water mains by electrolysis on Twelfth Avenue near Jefferson Street, and on other streets in this section of the city. The Puget Sound Traction, Light & Power Company is at this time completing an elaborate system of negative feeders, by which it is proposed to return stray current to the various substations. This system will cover practically every electric line in the city, and is considered by the traction company the best means of controlling the current with the exception of a double trolley system on the street railway lines, which is considered so expensive as to be prohibitive. It is estimated the traction company will expend about $50,000 in construction of this system.

PORTLAND, ORE.—Work has started on the electrification of the Southern Pacific Company's west side line from Whiteson to Corvallis. The cost is estimated at $800,000, not including the terminals at Corvallis.

WEST LINN, ORE.—The Portland Railway Light & Power Company, of Portland, has petitioned the Town Council for a franchise for installing power lines and distributing energy for power and light in the suburbs of Oregon City. In return for this franchise, the company offers 18 free street lights to West Linn. The company is seeking a blanket franchise.

EAST SAN DIEGO, CAL.—The San Diego Electric Railroad Company has secured a franchise for the extension of its University Avenue line from Fairmont to Euclid Avenue, a distance of eight blocks.

FILLMORE, CAL.—Arrangements have been completed whereby the Ventura County Power Company will install a distributing system in the Bairdsdale community. The work is to commence at once and be completed within 60 days.

LOS ANGELES, CAL.—E. F. Scattergood, chief engineer of the power bureau, has announced that the city has signed light and power contracts with 60 per cent of the consumers in the district north of East Main Street and north of the river. The district includes East Los Angeles, Carvanza and Highland Park, and was selected as a beginning in a local distributing system.

SAN FRANCISCO, CAL.—Plans will be completed shortly for the new building of the Western Union Telegraph Company to be erected on the northeast corner of Montgomery and California Streets.

SAN FRANCISCO, CAL.—Working drawings have been completed by the engineering department of the Great Western Power Company for the new power station to be erected on Bush Street, near Grant Avenue, at a cost of $100,000.

CANADA.

TORONTO, ONT.—The Hydroelectric Commission of the Province of Ontario has arranged to purchase the holdings of the Electric Power Company and its 22 subsidiaries for $8,500,000. The plants will hereafter be operated under government supervision. The Electric Power Company controlled water powers on the Trent River and the government has purchased the plants in order to serve Central and Eastern Ontario with cheap power, similar to the plan now in operation in Western Ontario, the distribution to be made at cost. It is expected the Trent development will be extended as far east as Picton and Kingston, Ont.

EDMONTON, ALTA.—A light and power system is contemplated by the Alliance Trust Company, of Calgary, Alta., R. B. Bennett, president, M. P.; George Robinson, manager of the trust company, will form a separate company to furnish city with power, and seek franchise for 25 to 30 years.

New Publications

CANADIAN MINES BRANCH.—The Mines Branch of the Department of Mines at Ottawa has issued two interesting publications. No. 406 describes the laboratories of the department, and is replete with illustrations. Among the equipment are an electric furnace and apparatus for fuel testing. No. 408 is a "Preliminary Report on the Mineral Production of Canada During 1915," prepared by John McLeish.

RADIATION FROM BLACK BODY.—Scientific Paper No. 262, issued by the Bureau of Standards, Washington, D. C., is entitled "Present Status of the Determination of the Constant of Total Radiation From a Black Body," by W. W. Coblentz. The constant referred to is that of the Stefan law, connecting its radiated power with the absolute temperature, and its value is 5.75×10^{-12}, the units being the watt, centimeter and centigrade degree.

Proposals

CHOTEAU, MONT.—Bids will be received April 3 for installation of a lighting system. About 26 single street light posts, 40 street hoods, and 6,000 feet park and suburban cable will be required. Address G. M. Coffey, mayor.

WILLISTON, N. D.—Bids will be received April 1 for the construction of telephone line, about 22 miles of main and 2 miles side line. Bids will also be received for telephones in houses; material f. o. b. Williston. McKenzie Farmer Telephone Company, A. J. Fanger, clerk.

SPRINGFIELD, ILL.—Sealed proposals will be received by the Board of Administration in its office in the Capitol Building, Springfield, April 4, for installing switchboard, placing new tile floor, and interior painting of engine rooms at the Peoria State Hospital, South Bartonville, Ill. Address Frank D. Whipp, fiscal supervisor of the Board of Administration, Springfield, Ill.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 9413—Washington, D. C., 600 feet six-pair, rubber-insulated cable; 200 steam-tight, marine lighting fixtures, and miscellaneous electrical supplies. Schedule 9427—Philadelphia, Pa., 2,000 refillable plug fuses, and miscellaneous renewable inclosed fuses. Schedule 9427—Brooklyn, N. Y., 20 portable ventilating sets. Bidders desiring to submit proposals should make application for schedules to the Bureau or Purchasing Office nearest to navy yard where delivery is to be made.

ELECTRICAL SUPPLIES.—Sealed proposals will be received until March 27 at Room 614, City Hall, Chicago, Ill., for furnishing and delivering to the Department of Gas and Electricity electrical supplies, strictly in accordance with specifications on file in the office of the Commissioner of Gas and Electricity, in the following approximate quantities: 5,000 feet two-conductor and 5,000 feet four-conductor, No. 16 B. & S. gauge, rubber and lead-covered fire-alarm cable; 11,000 feet 10-pair, 32,120 feet 15-pair, 12,000 feet 30-pair and 2,000 feet 50-pair, No. 19 B. & S. gauge, paper and lead-covered fire-alarm cable; 3,000 feet type RS, 7,000-volt, single-conductor cable; 3,000 feet type RS, 2,500-volt, duplex, No. 8 stranded conductor, rubber-insulated, tinned copper wire; 24,000 feet No. 6 B. & S. gauge, single-conductor, rubber-covered, varnished-cloth insulated, lead-covered, electric-light cable; 1,000 feet No. 6 B. & S. gauge, varnished-cambric insulated, lead-covered, armored and braided cable; 11 miles No. 6 B. & S. gauge triple-braided, weatherproof, hard-drawn copper wire; 400 pounds No. 6 B. & S. gauge triple-braided, weatherproof, soft-drawn copper wire; 1,000 pounds No. 10 B. & S. gauge soft-drawn bare copper wire; 25 miles No. 10 B. & S. gauge copper-clad bare wire, 40 per cent; 13 miles No. 10 B. & S. gauge triple-braided, copper-clad weatherproof wire, 40 per cent; 35,000 feet No. 14 B. & S. gauge, rubber-covered, single-braided copper wire, New Code; 16,000 feet ¼-inch non-rotating wire rope, for Bureau of Electric Wiring and Repairs. William G. Keith, Commissioner of Gas and Electricity.

Financial Notes

Chicago Telephone Company reports 512,700 telephones in service, or 40,000 more than a year ago.

The annual report of the Western Electric Company, Incorporated, covers a year's operation of the business, although the present company was organized last December. The report says: "As the incorporation of this company under the laws of the state of New York, on November 17, 1915, together with the purchase of the going business of the Western Electric Company (an Illinois corporation) and the assumption of the latter company's obligations, was in effect a reorganization and change of domicile of the latter company, in this report we shall cover the operation of the two companies during the year, thus giving the results of the continuing business, without attempting to segregate that part which pertains only to the operations of the Western Electric Company, Incorporated." Significant comparisons with previous years are as follows:

	1915.	1914.	1913.
Sales	$63,852,000	$66,408,000	$77,533,000
Div. paid	1,609,500	1,500,000	1,500,000
To surplus	1,217,613	1,170,960	1,671,675

The orders on hand at January 1, 1916, amounted to $2,111,000 more than on January 1, 1915. The number of employees on January 1, 1916, was 17,135, as compared with 15,650 on January 1, 1915. The total disbursements from the Employees' Benefit Fund for 1915 amounted to $230,468, and were made to 2,120 beneficiaries. Through the *Eastland* calamity of July 24, 1915, 465 employees of the company lost their lives. Many of them were younger employees in period of service, and their relatives were not entitled to relief under the benefit plan. The directors, however, authorized general measures for the aid of those who depended for their support upon Western Electric employees who were lost. The total expenditure on account of benefits and relief made by the company during 1915 amounted to upwards of $331,000.

Dividends.

	Term	Rate	Payable
Am. Gas & Elec.	Q	2.5 %	Apr. 1
Am. Gas & Elec., pf.	Q	1.5 %	May 1
Asheville Pr. & Lt., pf.	Q	1.75%	Apr. 1
Bangor Ry. & Elec., pf.	Q	1.75%	Apr. 1
Cal. Ry. & Pw., prior pf.	Q	1.75%	Apr. 1
Can. Westinghouse	Q	1.75%	Apr. 10
Cap. Trac., Wash.	Q	1.25%	Apr. 1
Caro. Pw. & Lt., pf.	Q	1.75%	Apr. 1
Cin. & Ham. Trac.	Q	1 %	Apr. 1
Cin. & Ham. Trac., pf.	Q	1.25%	Apr. 1
Cin. & Sub. Bell Tel.	Q	2.5 %	Apr. 1
Cities Service, deb.	—	3 %	July 1
Cities Service, pf.	M	0.5 %	Apr. 1
Columbia Ry., Pw. & Lt.	Q	1.5 %	Apr. 1
Conn. V. St., pf.	—	3 %	Mar. 1
Dayton Pw. & Lt., pf.	Q	1.5 %	Apr. 1
Elec. Securities	Q	2 %	Apr. 1
Elec. Securities	Q	1.25%	Apr. 1
Halifax Elec. Tram	Q	2 %	Apr. 1
Houghton Co. Trac., pf.	—	3 %	Apr. 1
Indiana Pw. & Lt.	Q	$2	May 15
Nat. Gas & Elec.	Q	1 %	Apr. 1
Nat. Gas & Elec., pf.	Q	1.5 %	Apr. 1
N. Y. St. Rys.	Q	1.25%	Apr. 1
N. W. Elec., pf.	Q	1.5 %	Apr. 1
Phila. Co., pf.	S	3 %	May 1
Ridge Av. Pas., Phila.	Q	$3	Apr. 1
Scioto Val. Tr., 1st & 2d pf.	Q	1.25%	Apr. 1
Sierra-Pac. Elec., pf.	Q	1 %	May 1
Sou. Util., pf.	Q	1.75%	Apr. 1
Toronto Ry.	Q	2 %	Apr. 1
Tri-City Ry.	Q	2 %	Apr. 1
Wash., Balt. & Annap., pf.	Q	1.5 %	Mar. 31
West India Elec.	Q	1.25%	Apr. 1
West. Pw., pf.	Q	1 %	Apr. 15
West. Union Tel.	Q	1.25%	Apr. 15

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Mar. 20	Mar. 13
American Tel. & Tel. (New York)	129½	128⅝
Commonwealth Edison (Chicago)	143	143
Edison Electric Illuminating (Boston)	248½	245
Electric Storage Battery, common (Philadelphia)	64	63¼
Electric Storage Battery, preferred (Philadelphia)	64	63⅛
General Electric (New York)	169½	169
Kings County Electric (New York)	129	129
Massachusetts Electric, common (Boston)	7	7
Massachusetts Electric, preferred stamped (Boston)	37	37
National Carbon, common (Chicago)	183	—
National Carbon, preferred (Chicago)	—	122
New England Telephone (Boston)	136	136
Philadelphia Electric (Philadelphia)	27⅝	27¼
Postal Telegraph and Cables, common (New York)	29⅛	78
Postal Telegraph and Cables, preferred (New York)	67	66⅞
Western Union (New York)	91	89¼
Westinghouse, common (New York)	68½	65
Westinghouse, preferred (New York)	77	75

New Incorporations

ALBANY, N. Y.—Radio Engineering Company of New York. Capital, $100,000. Devices appertaining to wireless telegraphy and telephony. Incorporators: J. H. Hammond, Jr., Harris Hammond, and R. D. Hanna, all of 120 Broadway, New York City.

WILMINGTON, DEL.—General Public Service Corporation, of Philadelphia. Capital, $100,000. To conduct the business of an electric light company in all its branches. Incorporators: W. J. White, W. A. Welsh, Philadelphia; R. R. Kenney, Dover.

PHILADELPHIA, PA.—Rosen Manufacturing Company. Capital, $5,000. Manufacture combination fixtures. Incorporators: Frank Rosen and others.

ST. LOUIS, MO.—Potter Signal & Manufacturing Company. Capital, $150,000. Electric-signal manufacturing. Incorporators: C. E. Potter, A. L. Potter and C. A. Powers.

Electrical Patents Issued March 14, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,174,952. Trolley Wheel. H. C. Adam, Hamilton, and J. C. Adam, Trenton, Ont., Canada. Has roller bearing.

1,174,955. Motor-Driven Centrifugal Extractor. F. Balzer, assignor to Troy Laundry Machinery Co., Chicago, Ill. Mounting of motor driving vertical shaft.

1,174,956. Player for Sound-Producing Devices. D. W. Barton, assignor to W. G. Maxcy, Oshkosh, Wis. Electromagnetically controlled hammer for pianos, etc.

1,174,957. Piano Attachment. D. W. Barton, assignor to W. G. Maxcy. Several instruments electrically controlled by same keys.

1,174,958. Means for Insulating Electromagnets. D. W. Barton, assignor to W. G. Maxcy. In electromagnetic piano-players.

1,174,962. Desk Lamp. E. H. Binns, Pittsburgh, Pa. Lamp stand and downward reflector for roll-top desk.

1,174,966. Electrical Scenic Effect. R. H. Burnside, New York, N. Y. Series of ladders have illuminated rungs and carry combined floral and electrical display.

1,174,969. Signal-Transmitter. W. J. Davis and D. G. Knittel, assignors to American Fire Alarm Company, Pittsburgh, Pa. Fire-alarm call box.

1,174,974. Electric Switch. L. H. Ford, Abilene, Kans. Knife switch operated by pull cords.

1,174,989. Automatic Throw-Off and Cylinder-Adjusting Mechanism for Rotary Presses. E. L. Jones, assignor to A. B. Huey, Philadelphia, Pa. Electromagnetically controlled by sheet.

1,174,992. Car Fender. J. B. Klein, Kansas City, Kans. Pushing in of bumper applies brakes and operates switch.

1,175,010. Thermostat. E. M. Petersohn, Chicago, Ill. Details of contact device.

1,175,040. Combination Electric Fan and Lamp. R. W. Armstrong and W. S. Evans, assignors to Safety Car Heating & Lighting Co., Jersey City, N. J. Ceiling structure for railway car.

1,175,047. Multiple Pump-Controlled Device. H. S. Clark, assignor to Westinghouse Air Brake Co., Wilmerding, Pa. Electrically interconnected compressor and motor governors.

1,175,048. Transmitter. J. J. Comer, assignor to Automatic Enunciator Co., Chicago, Ill. Granule chamber for microphone with special vibration damping.

1,175,051. Signaling Device for Automobiles. R. F. Darrow, East Chicago, Ind. Electromagnetically operated direction indicator.

1,175,052. Plug and Socket. J. N. Davis, Denver, Colo. For establishing charging connections with electric vehicles.

1,175,053. Electropneumatic Brake. J. S. Doyle, assignor to Westinghouse Air Brake Co. Air brakes electrically controlled from master switch.

1,175,059. Accounting System. F. O. Heuser, assignor to W. R. Heath, Buffalo, N. Y. Electrically operated wage-calculator.

1,175,062. Automatic Switch for Vehicles. W. A. Johnson, Yonkers, N. Y. Operated by pendulum according to inclination of vehicle.

1,175,063 and 1,175,064. Motor Road-Vehicle for Searchlight and the Like Operations. I. Koechlin, assignor to Societe Anonyme des Automobiles et Cycles Peugeot, Paris, France. First patent: Truck for transporting electric searchlight has provision for shifting it about on truck. Second patent: Modification.

1,175,077. Sheet-Metal Polearm. C. L. Pierce, Jr., Pittsburgh, Pa. Insulator-supporting crossarm.

1,175,078. Insulator-Supporting Fixture. C. L. Pierce, Jr. Pole-bracket formed of metal pipe. (See cut.)

1,175,082. Apparatus for the Electric Transmission of Signs or Speech in Mines. J. H. Reineke, assignor to Studiengesellschaft für Drahtlose Grubentelefonie M. B. H., Cologne-Lindenthal, Germany. Utilizes the conventional conductive metal construction in mine service.

1,175,086. Electrical Signaling Device. E. E. Salisbury, Chicago, Ill. Indicators selectively controlled by variation of duration of contact of interrupter.

1,175,089. Safety Device for Cars. W. V. Turner, assignor to Westinghouse Air Brake Co. Switch in motor circuit operated by pressure from brake cylinder.

1,175,103. Pothead Cutout. P. F. Williams, assignor to G. & W. Electric Specialty Co., Chicago, Ill. Mounting of fuse box.

1,175,104. Telephone System. B. D. Willis, assignor to Automatic Electric Co., Chicago, Ill. Signal arrangements for main and branch exchanges.

1,175,111. Means for Preventing Inductive Disturbance in the Test Circuits of Telephone Switchboards. H. M. Bascom, assignor to American Telephone & Telegraph Co., New York, N. Y. Operator's instrument connected with test conductors through repeater coil having differential primaries.

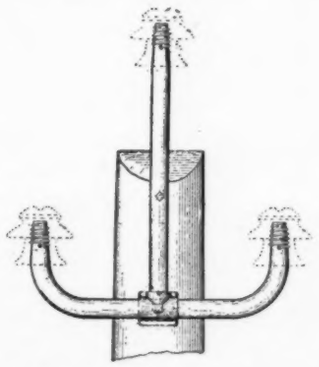
1,175,112. Telephone System. H. M. Bascom, assignor to American Telephone & Telegraph Co. Supervisory relays short-circuited on connecting link circuit.

1,175,119. Automatic Telephone Switching Apparatus. A. H. Blessing, assignor to Automatic Electric Co. Operation of automatic connector switch.

1,175,170. Remote-Control Pumping System. T. F. Mulligan, assignor to S. F. Browser & Co., Fort Wayne, Ind. Circuit of pump motor controlled by valve in discharge line.

1,175,176. Self-Cleaning Spark Plug. J. Prescott, St. Boniface, Man., Canada. Outside points from cage containing ball.

1,175,177. Controlling Device for Variable-Speed Electric Motors. C. Redfield, Ogden, Utah. Alternating motor controlled by varying magnetic circuit, of inductance in armature circuit and of compensating coils.



No. 1,175,078.—Insulator-Supporting Fixture.

1,175,220. Door-Controlled Elevator System. A. Beck and C. Beck, assignors to Safety Appliance Co., St. Louis, Mo. Controls safety, signal and motor circuits.

1,175,222. Phase-Modifying Apparatus. H. J. Blakeslee, Syracuse, N. Y. For varying phase of voltage on shunt of meter regardless of phase of meter current.

1,175,234. Electric Water-Heater. G. A. Burroughs and W. Grant, Sudbury, Ont., Canada. Arrangement of electric heater in header of hot-water furnace.

1,175,241. Automatic Train Signal. W. J. Cook, Denver, Colo. Electromagnetically actuated mechanism for operating signal.

1,175,252. Method of Producing Rotating Electric Arcs. A. Foss, assignor to Norsk Hydro-Elektrisk Kvaelstofaktieselskab, Christiania, Norway. Arc supported throughout its length by two concentric, annular gas currents.

1,175,268. Underrunning-Trolley System for Electric Cars. J. Joyce, Oswego, N. Y. Structure for use with sectional conductor and continuous main conductor.

1,175,271. Vehicle Signal. H. R. Kennedy, Los Angeles, Cal. Electrically illuminated and operated semaphore.

1,175,279. Switch. A. J. Loguin, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Has special operating levers and links for wiping butt contacts in closing and pressing them firmly together.

1,175,280. Storage Battery. J. O. Luthy, San Antonio, Tex. Sealed device having paste in electrolyte embedding electrodes and gas-absorbing material, with venting and liquid-charging opening in bottom.

1,175,295. System of and Apparatus for the Control of Electric Motors. C. V. Raper, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. For planers, etc.

1,175,305. Trolley-Supporting Mechanism. W. Schaake, assignor to Westinghouse Electric & Mfg. Co. Readily detachable spring mechanism mounted in vertical, cylindrical pole base.

1,175,308. Electric Switch. H. R. Schultz, assignor to Westinghouse Electric & Mfg. Co. Oil switch adjustable into and out of operative relation to overload trip and for manual operation.

1,175,320. System of Distribution. T. W. Varley, assignor to Westinghouse Electric & Mfg. Co. Arrangement of transformer windings for phase transformation.

1,175,321. System of Electric-Motor Control. T. Varney, assignor to Westinghouse Electric & Mfg. Co. Resistance controlled by magnetic switches having coils tending to close but normally excessively energized to hold switches open and opposing coils energized according to counter E. M. F. of armature.

1,175,322. System of Electric-Motor Control. H. C. Walter, assignor to Westinghouse Electric & Mfg. Co. Method of braking direct-current motor.

1,175,323. Electromagnet and Electrically Operated Switch. R. Wikander, assignor to Westinghouse Electric & Mfg. Co. Operates switch within predetermined limits of magnetization.

1,175,326. Automobile-Starter. C. E. Wilson, assignor to Westinghouse Electric & Mfg. Co. Mounting of starting motor and gearing to engine shaft.

1,175,330. Circuit-Breaker. J. L. Adams, Jr., assignor to Westinghouse Electric & Mfg. Co. Magnets close breaker on predetermined voltage conditions in number of circuits and open same on abnormal conditions.

1,175,333. Starting Device for Automobiles. H. L. Beach, assignor to Westinghouse Electric & Mfg. Co. Automatic gearing for connecting starting motor.

1,175,335. Fuse-Tester. H. A. Bremer, Jr., Jersey City, N. J. Device for mounting cartridge fuse in testing position and having lamp indicating condition of fuse.

1,175,338. Device for Producing Polar Oscillograms. L. W. Chubb, assignor to Westinghouse Electric & Mfg. Co. Manner of exposing sensitized film.

1,175,339. Signaling System. W. Churchill and A. H. Rudd, assignors to Position-Light Signal Co., Maine. Manner of illumination for light signaling by day and night.

1,175,343. Plug Connector. F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Simple structure for end of insulated, flexible conductor.

1,175,344. Electrical System. A. W. Copeley and B. D. Kunkle, assignors to Westinghouse Electric & Mfg. Co. For engine ignition.

1,175,346. Control System for Electric Motors. R. J. Dearborn, assignor to Westinghouse Electric & Mfg. Co. For hoist or crane control.

1,175,350. Hoist-Operating and Controlling System. E. Friedlaender, assignor to Westinghouse Electric & Mfg. Co. Motor controller actuated by the hoist-driving mechanism.

1,175,358. Starting Apparatus for Electric Motors. H. D. James, assignor to Westinghouse Electric & Mfg. Co. Resistance controlled by switches operated by magneto having differential coils across the resistance steps and in series with the motor respectively.

1,175,359. System of Motor Control. H.

D. James, assignor to Westinghouse Electric & Mfg. Co. Speed of main motor controlled by automatically connected and disconnection auxiliary motor.

1,175,362. Ignition System. B. D. Kunkle, assignor to Westinghouse Electric & Mfg. Co. Interrupter connections reversed on closing starting motor circuit.

1,175,367. Motor-Control System. W. O. Lum, assignor to Westinghouse Electric & Mfg. Co. Automatic torque-controlling means operative for one direction of rotation only.

1,175,368. Controller for Elevators. B. McInnerney, assignor to Westinghouse Electric & Mfg. Co. Selective, interlocked station relays and switches rendered ineffective by failure of current in emergency relay circuit.

1,175,370. Secondary-Battery Electrode and Process of Making the Same. W. Morrison, Des Moines, Iowa. Superficially permeated with titanium compound.

1,175,377. Motor Vehicle. J. W. Pearson, Chicago, Ill. Storage-battery system for automobiles including series motors with dynamic brake and directional connections controlled by steering wheel.

1,175,378. Circuit-Controller. H. P. Reed, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. For motors; power-operated with electroresponsive trip.

1,175,396. Telephone System with Service Meters. G. D. Wolf, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. In cord circuit; registers both partial and completed connections.

1,175,417. Electric Meter and Fluid Gauge. A. Fehrenbach, K. O. Fehrenbach and R. Fehrenbach, Woodbury, N. J. Electric indicator operated by float-controlled rheostat.

1,175,418. Wireless Telegraphy. R. A. Fessenden, assignor to S. M. Kinter, Pittsburgh, Pa., and H. M. Darrett, Bloomfield, N. J. Movable electrode of spark gap driven by generator and frequency and spark point on potential curve varied by adjusting stationary electrode.

1,175,424. Insulating Composition. W. K. Freeman, Oscawana, N. Y., assignor to Hydrolose Process Corporation. Made from sulphite cellulose liquor.

1,175,432. Thermoscope. E. Garretson, Buffalo, N. Y. Body of silver sulphide depending for its operation on impressed voltage and surrounding temperature.

1,175,433. Resistance Unit and Manufacture Thereof. J. G. Goetsch, assignor to Cutler-Hammer Mfg. Co. Resistance ribbon has beads defining its points of flexure.

1,175,434. Motor Controller. M. M. Goldenstein, assignor to the Cutler-Hammer Mfg. Co. Automatically controlled starter and accelerator.

1,175,435. Electric Transporting Device. H. Gradenwitz, W. Vollbrecht and H. Levzow, assignors to Elektromotoren-Werke Hermann Gradenwitz, Berlin, Germany. Operating device for a hoisting grab.

1,175,441. Electric Controller. J. H. Hall, assignor to Electric Controller & Mfg. Co., Cleveland, O. Motor resistance controlled by automatic, successive electromagnetically operated switches.

1,175,442. Electric Cooking or Heating Apparatus. M. W. Hanks, Indianapolis, Ind. For cooking eggs, etc.

1,175,444. Signal Box. B. B. Hatch, Boston, Mass. Adapted to enter recess in wall.

1,175,450. Cabinet for X-Ray Apparatus. G. R. Hogan and H. P. MacLagan, Chicago, Ill. Special arrangement of opaque and fluorescent screens and door.

1,175,452. Lightning-Arrester. R. P. Jackson, assignor to Westinghouse Electric & Mfg. Co. Electrolytic type.

1,175,470. Water-Heating Apparatus. F. C. Perkins, Buffalo, N. Y., assignor of one-eighth each to G. J. Meyer, G. H. Meyer, L. P. Meyer and E. Meyer. Water circulating through tank and pipe coils heated by current through tank and coils.

1,175,472. Coupling for Electrical Oscillation Circuits. R. H. Rendahl, assignor to Gesellschaft für Drahtlose Telegraphie M. B. H., Berlin, Germany. Oscillation circuit and circuit containing non-inductive detector connected by high-frequency transformer without stray flux.

1,175,488. Telephone-Switchboard Operating and Signaling Device and System. H. S. Turner, San Diego, Cal. Special switchboard arrangements and connections.

1,175,489. Self-Inductive Means for Electrical Oscillatory Circuits. G. von Arco and R. H. Rendahl, assignors to Gesellschaft für Drahtlose Telegraphie M. B. H. Special flat, spiral coil of ribbon formed of transposed strands.

1,175,498. Extension Electrical Fixture. E. G. K. Anderson, Chicago, Ill. Has reel for lamp cord connecting attaching plug with lamp socket.

1,175,508. Excess Wattmeter. A. W. Burke, Wilmington, Del. Potential coil neutralizes effect of series coil up to a certain current value.

1,175,516. Rotary Electric Welding Machine. L. P. French, assignor to T. J. French, Stoughton, Mass. For welding wire intersections of screens, etc.

1,175,528. Socket Shell. J. Keefe, assignor to The Zee Socket & Mfg. Co., Boston, Mass. Relates to insulating lining.

1,175,535. Storage-Battery System. J. T. Lister, assignor to Turbine Motor Electric Car Co., Cleveland, O. Has duplicate batteries, one charging while the other is in use.

1,175,541. Circuit-Timing Device. W. Meyer, Chicago, Ill. Dashpot controls duration of circuit closure.

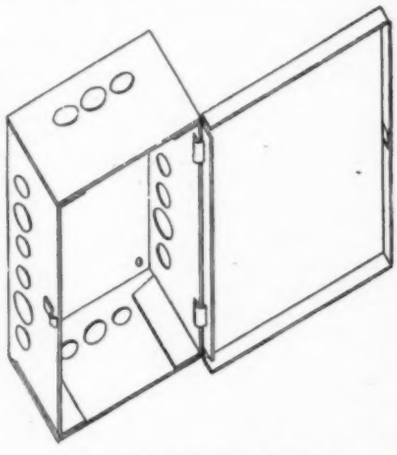
1,175,554. Electric Light and Power System. C. C. Nichols and W. G. Wright, assignors to Nichols & Wright Motor Co., Buffalo, N. Y. Regulation of gas engine, generator and storage-battery system.

1,175,572. Apparatus for Bleaching by Electrolysis. J. W. Webb, Battersea, London, and W. W. Williams, Enham, England. Electrolytic preparation of bleaching fluid.

1,175,573. Automatic Weighing Machine. H. S. Weyant, Yonkers, N. Y. Magnetically operated hopper valves controlled by scale beam.

1,175,579. Service-Meter Circuit for Telephone Systems. F. Aldendorff, assignor to Western Electric Co., New York, N. Y. Conversation counters in automatic system.

1,175,588. Railway Signaling. E. F. Bliss, assignor to Union Switch & Signal Co., Swissvale, Pa. Block system for single-track sections having sidings between stations.



No. 1,175,865.—Switch Cabinet.

1,175,590. Electric-Light Socket. T. A. C. Both, assignor to Zee Socket & Mfg. Co. Relates to the switch mechanism.

1,175,610. Clock or Watch. G. H. Cove, New York, N. Y. Has electromagnetically operated balance wheel.

1,175,630. Switch. D. C. Hare, Wilkinsburg, Pa. Details of structure for group connections.

1,175,651. Terminal Connector for Storage Batteries. P. M. Marko, New York, N. Y. Structural details.

1,175,668. Electrical System. R. Varley, Englewood, N. J. Engine-ignition system.

1,175,669. Motor-Control System. T. Varney, assignor to Westinghouse Electric & Mfg. Co. Control of motor in conjunction with magnetic brake.

1,175,670. Telephone Mechanism for Trolley Cars. L. Zsitkovszky, Philadelphia, Pa. Arrangement of connections through trolley pole.

1,175,676. Commutator-Slotter. G. E. Austin, New York, and F. A. Lachance, Brooklyn, N. Y. Special machine for purpose indicated.

1,175,685. Tachytelegraph and Teletype Machine. E. Belin, Paris, France. Special transmitter controlled by perforated band.

1,175,699. Electrical Relay. S. G. Brown, London, England. For inclusion in wireless detector circuit for relaying signals.

1,175,704. Automatic Railway-Train Stop. R. Cecchini, Springfield, Mass. Electropneumatic control of locomotive effected by danger position.

1,175,724. Chromium Alloys. W. B. Driver, East Orange, N. J. For resistance elements.

1,175,746. Music-Leaf Turner. C. R. Greene, Reading, Pa. Electric motor operated.

1,175,749. Lightning-Protecting System for Oil Tanks. C. H. Gunthorpe, Beaumont, Tex. Wires about tank connected with ground through arresters.

1,175,754. Electric Attachment for Clocks. J. O. Hamilton, Manhattan, Kans. Automatic program attachment.

1,175,788. Animal-Feeding Mechanism. E. Martin, Huguenot, N. Y. Electrically operated, clock controlled.

1,175,797. Rat-Trap. G. E. Newell, Eliasville, Tex. Doors electromagnetically operated by weight of animal.

1,175,821. Igniter Mechanism for Explosive Engines. E. Rounds, assignor of one-half to Gunther-Wright Machine Co., Owensboro, Ky. Make-and-brake sparking mechanism.

1,175,838. Electric Switch. C. J. Sutter, St. Louis, Mo. Combination pull cord and push button.

1,175,843. Traffic Signal. J. Tomaszewski, Pine Bluff, Ark. Details of electric motor-operated direction pointer.

1,175,849. Insulator Base. F. A. Warren, Canon City, Colo. For securing insulator to side of pole.

1,175,857. Apparatus for Forming Filaments. L. P. Wilson, assignor to Courtaulds, Ltd., London, England. Tubular cellulose filament encloses, as it is formed, a core filament.

1,175,864. Magnetic Valve. E. E. Gold, assignor to Gold Car Heating & Lighting Company, New York, N. Y. Valve structure comprises operating electromagnet.

1,175,865. Box for Electrical Installations. R. A. Griswold, A. E. Griswold and C. B. Bush, Seattle, Wash. For switch and cut-out cabinets. (See cut.)

1,175,896. Telephone Apparatus. B. D. Willis, assignor to First Trust & Savings Bank, Chicago, Ill. Semi-automatic exchange system.

1,175,901. Timer for Internal-Combustion Engines. R. E. Noah, assignor to C. A. Beardmore, Anne Arundel County, Md. Structural details.

1,175,905. Process of Hydrogenating Oils or Fats. W. D. Richardson, assignor to Swift & Co., Chicago, Ill. Submerged arc is formed in treated material.

Reissue 14,085. Lock for Automobiles. P. Cyr, assignor of one-half to W. J. Downey, Hyde Park, Mass. Original No. 1,162,224, dated Nov. 30, 1915. Electric contacting device requires predetermined combination of operations similar to combination lock.

Reissue 14,088. Flashlight. H. M. Koretsky, New York, N. Y. Lamp, battery, etc., in casing resembling watch.

PATENTS EXPIRED.

The following United States electrical patents expired March 21, 1916:

621,321. Electric Railway System. G. L. Campbell, Dushore, Pa.

621,324. Combined Pump and Motor. N. A. Christensen, Milwaukee, Wis.

621,346. Automatic Telephone Switch. C. S. Karoly, Aurora, Ill.

621,352. Supply of Current to and Governing Arc Lamps. F. M. Lewis, London, England.

621,361. Electric Burglar-Alarm System. D. W. McCaughey, Chicago, Ill.

621,412. Transfer Wattmeter Switch for Storage-Battery Circuits. C. Hewitt, Philadelphia, Pa.

621,417. Electric Arc Lamp. E. Hungerbuhler, London, England.

621,422. Trolley Catcher. R. I. Kroft, Avon Lake, Ohio.

621,449. Telephone System. C. E. Egan, B. L. Lawton and E. C. Wilcox, Meriden, Conn.

621,471. Switch for Altering Speed and Direction of Revolution of Electric Motors, etc. W. R. Edwards and S. F. Beevor, London, England.

621,492. Electric Railway. W. J. George, Johnstown, Pa.

621,575. Electrical Warp Stop Motion for Looms. F. E. Kip, Montclair, N. J.

621,594. Electrical Warp Stop Motion for Looms. W. H. Baker, Central Falls, R. I., and F. E. Kip, Montclair, N. J.

621,604. Electric Heater. E. B. Gold, New York, N. Y.

621,631. Section Insulator. E. J. Cook, Cleveland, Ohio.

621,661. Insulator. M. Harloe and W. S. Bloes, Peckville, Pa.

621,716. Secondary-Battery Plate. A. Schanschieff and A. E. Hodgson, Halifax, England.

621,717. Dynamoelectric Machine. C. Sellers, Philadelphia, Pa.

621,733. Electric Belt. T. F. Wynne, Lindale, Tex.

621,739. Automatic Electric Switch. R. Baumann, St. Louis, Mo.